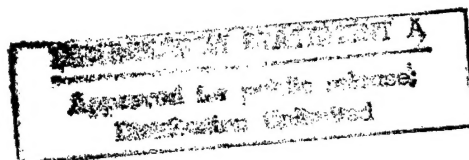


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JPRS 81517

12 August 1982



# USSR Report

CHEMISTRY

No. 89

19980902 064

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12 August 1982

## USSR REPORT

## CHEMISTRY

No. 89

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## ADSORPTION

UDC: 546.49-121:621.039.75

### ADSORPTION OF METALLIC MERCURY VAPOR BY ACCUMULATING POLYMER COATINGS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 55, No 4, Apr 82  
(manuscript received 17 Aug 79) pp 850-855

KONDRAT'KO, M. Ya., SIMANOVSKIY, Yu. M., KHOKHREKOV, V. I. and  
SHTAN'KO, V. I.

[Abstract] A study is made of the static adsorption of metallic mercury vapor in certain compositions of accumulating protective polymer coatings containing an aqueous solution of polyvinyl alcohol or a polyvinyl acetate emulsion as the film-forming base. The method of radioactive indicators with  $^{203}\text{Hg}$  as the label was used in an experimental installation which blew mercury vapor past suspended plates carrying the material studied. The experimental data allow estimation of the coefficients of diffusion of mercury in the coating substances. The most effective coating composition for adsorption and firm holding of atomic mercury must combine a sufficient concentration of a chemically active sorbent such as  $\text{MnO}_2$  with a porous open structure of the polymer film. Optimal formulas can be sought by the use of surface-active agents and gel formers or foam-forming agents to increase the working surface. The coatings studied, if applied in a room with a volume of 1000 cubic meters and a total surface of about 6000 square meters, could absorb up to 35-40% of the total mercury in the air at the saturated vapor pressure. The use of forced ventilation would improve the effect still further. Figures 4; references 5: 4 Russian, 1 Western.

[232-6508]

## ANALYTICAL CHEMISTRY

UDC 678.13 : 546.18 : 543.42

### SPECTROPHOTOMETRIC STUDY OF REACTION OF ACRYLONITRILE COPOLYMER, METHACRYLATE, ITACONIC ACID AND PHOSPHOMOLYBDIC HETEROPOLY ACID IN DIMETHYLFORMAMIDE SOLUTIONS

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 82  
(manuscript received 5 Dec 80) pp 21-23

KHASANOVA, M. R., STREL'NIKOVA, G. B. and GELLER, A. A., Tashkent Institute of Textiles and Light Industry

[Abstract] Changes in the nature of the solvent such as introduction of dimethylformamide fundamentally change reactions between phosphato- and molybdathions, with the pH of the solution playing a large role. The authors studied the reaction of acrylonitrile ionometric copolymers with heteropoly acid in dimethylformamide by spectrophotometry, including the title compounds, in the proportion of 92.5% acrylonitrile, 6.2% methacrylate, and 1.3% itaconic acid. The spectra of the solutions in dimethylformamide with constant heteropoly acid concentration indicated that with increased copolymer amounts there was a hypsochromic shift in light passage at  $\lambda = 295\text{--}300\text{ nm}$ , and band "washout" at 315 nm. The negative correlation of optical density deviation to the heteropoly acid/copolymer ratio suggests complex molecular reactions in the solution that lead to new complex compounds. Figures 3; references 4 (Russian).  
[208-12131]

UDC: 546.791.4

### INTERACTION PRODUCTS OF URANIUM (IV) TETRAFORMIATE AND NITROGEN-DONOR LIGANDS

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 27, No 4, Apr 82  
(manuscript received 8 Sep 81) pp 849-852

SPITSYN, V. I., DUNAYEVA, K. M., MAZO, G. N. and SANTALOVA, N. A.,  
Moscow State University imeni M. V. Lomonosov

[Abstract] This work continues studies of the products of interaction of uranium (IV) carboxylates and uranyl with N-donor ligands with low

temperature of decomposition to uranium dioxide. The interaction of uranium (IV) tetraformate with ammonia and methylamine under a vacuum was studied by heterogeneous synthesis in a solid-gas system. Formation of the compounds is represented as a multistage reaction of ammonolysis, the first stages including coordination of RNH groups to uranium accompanied by liberation of an  $\text{RNH}_3\text{OOCH}$  molecule. This is followed by a stage of formation of oxo bridges leading to dimerization of the complex. The coordination of substituted amino groups by uranium causes loss of equilibrium of the C-O bond of the island HCOO groups, facilitating formation of  $\text{RNHCHO}$  and, following intramolecular regrouping, development of the final complex in which, in addition to the oxo bridge connecting two uranium atoms, there are also oxygen atoms bonded to one atom of uranium like uranyl groups. The behavior of the compounds upon thermolysis confirms the assumptions made. References 9: 7 Russian, 2 Western.  
[204-6508]

UDC: 543.544:543.4

#### CHROMATIC-FLUORIMETRIC METHODS OF DETERMINING MICROQUANTITIES OF ORGANIC SUBSTANCES

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 37, No 4, Apr 82  
(manuscript received 23 Jun 80) pp 701-743

KOSTYUKOVSKIY, Ya. L. and MELAMED, D. B., Institute of Nutrition, USSR Academy of Medical Sciences, Moscow

[Abstract] Fluorimetric methods can in principle perform tasks which are difficult by other methods. They are particularly promising for determination of traces of organic substances. This review of chromatic-fluorimetric methods (CFM) covers methods combining chromatographic separation of substances with fluorimetric determination. An important feature of CFM is the possibility of producing fluorescent derivatives both before and after chromatographic separation, using all types of chromatographic separation including paper, thin layer, liquid and gas chromatography in all their varieties. CFM are suitable for both identification and quantitative determination of substances. This review summarizes a large number of the many widely varied sources of literature on the application of CFM for determination of microscopic quantities of organic substances. The information is classified by chemical reactions upon which the methods are founded. Extensive tables are presented summarizing the range of substances analyzed and the characteristics of the methods in question. References 224: 54 Russian, 170 Western.  
[230-6508]



DETERMINATION OF IMPURITIES IN DI(2-ETHYLHEXYL)PHOSPHORIC ACID

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 37, No 4, Apr 82  
(manuscript received 5 Jan 81) pp 744-747

IGNATENKO, A. V., PASTUKHOVA, I. V., PETROV, K. A., SMELOV, V. S.,  
CHAUZOV, V. A. and SHMIDT, V. S.

[Abstract] A search is undertaken for a reliable and simple method to determine the content of the primary substance and organophosphorus impurities in technical di(2-ethylhexyl)phosphoric acid. The composition of the acid was determined by calculation of the weights of acid and alkaline hydrolysates as well as the results of potentiometric titration of the initial specimen, the acid and alkaline hydrolysates using equations presented in the article. The method of  $^{31}\text{P}$  NMR spectroscopy is used to determine the content of the components in the technical acid to confirm the accuracy of the method described above. It is found that the acid contains mono(2-ethylhexyl)-phosphoric acid, tri(2-ethylhexyl)phosphate, tetra(2-ethylhexyl)pyrophosphate and sym-di(2-ethylhexyl)pyrophosphoric acid. Figure 1; references 3 (Russian).  
[230-6508]

## BIOCHEMISTRY

UDC: 639\*863.1:628.517:681.31

### PROGRAM FOR COMPUTER CALCULATION OF EXPECTED NOISE LEVELS IN PRODUCTION AREAS OF MICROBIOLOGICAL ENTERPRISES

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 3, 1982 (signed to press 9 Apr 82) pp 21-23

TATSI, L. A., KUZ'MICHEV, V. V. and TSYGAL'NITSKIY, V. M., "Gidrolizprom" Scientific Production Association

[Abstract] A computer program is presented in flow chart form for the calculation of expected noise levels in production areas resulting from the operation of equipment most commonly used in the microbiological industry today. Spectral noise power characteristics of several typical machines such as compressors, blowers and cutting machines are presented in tabular form. The program currently runs on a BESM-4M computer, in which memory size limits the number of points at which the noise level can be simultaneously calculated to 5. This limitation is overcome by dividing the rim into strips and calculating noise levels independently for each strip. In the future the program is to be run on more modern SM computers, allowing an increase in the number of points calculated to 50, the number of types of sound insulation for which calculations are performed from 2 to 3. Figure 1; references 5 (Russian).  
[234-6508]

## CATALYSIS

UDC 677.529.03: 662.749.38 + 677.021.12

### HYDROCARBON FIBERS BASED ON MESOPHASE PITCHES

Moscow KHIMICHESKIYE VOLOKNA in Russian No 2, Mar-Apr 82  
(manuscript received 12 May 81) pp 9-13

AZAROVA, M. T., SEMYAKINA, N. S., KONKIN, A. A. and TIKHOMIROVA, M. V.

[Abstract] Hydrocarbon filaments come largely from cellulose hydrate and polyacrylonitrile, which are expensive. The authors studied results obtained by such manufacturers as Union Carbide in producing these fibers from isotropic amorphous pitches. Obtaining hydrocarbon fibers from mesophase pitches is complicated by the two-phase, unimixed nature of the substances. High temperature petroleum cracking is being used to obtain initial fibers, which are then processed at very high temperatures (above 2500° C). Mesophase pitches form with a number of aromatic condensed compounds and impurities that lead to a defective, chaotic structure. The authors found that a system with low average molecular mass in the anisotropic portion, with 40-60% pitch mesophase, was a favorable form. Its formations would have "onion ring," radial and disorderly cross sections; the latter form was found to be best. Hydrocarbon fibers with superior mechanical properties were produced by thermal processing at 2500°+ C, yielding a highly oriented structure similar to graphite fibers, at much lower cost. Figures 5; references 41: 3 Russian, 38 Western.  
[209-12131]

NATURE OF ACTIVE CENTERS AND MECHANISM OF OLEFIN METATHESIS ON APPLIED  
OXIDE CATALYSTS OF MOLYBDENUM, TUNGSTEN AND RHENIUM

Moscow KINETIKA I KATALIZ in Russian Vol 23, No 2, Mar-Apr 82  
(manuscript received 8 Dec 80) pp 276-290

KADUSHIN, A. A., ALIYEV, R. K., KRYLOV, O. V., ANDREYEV, A. A.,  
YEDREVA-KARDZHIYEVA, R. M. and SHOPOV, D. M., Institute of Chemical Physics,  
USSR Academy of Sciences; Institute of Organic Chemistry, Bulgarian  
Academy of Sciences, Sofia

[Abstract] The authors undertook a systematic study of the effects of the carrier, activation conditions and the reaction itself on the formation and structure of active centers. Spectral characteristics of the systems studied were compared by infrared, ultraviolet, X-ray-electron and electron absorption spectroscopy, and X-ray-phase and chromatographic analyses. Catalytic activity in a metathesis reaction of propylene and butene-1 was tested in a quartz flow reactor at atmospheric pressure in a temperature range of 25-600° C, with contact time of 3-50 seconds. The deposited oxide catalysts of the title minerals are discussed in terms of preparing the catalysts, studying their activity, and observing optical spectra. Tungsten ions were found to reduce at higher temperatures than molybdenum ions. Olefin treatment brought reduction of rhenium to lower oxidation levels. The low activities of  $\text{Re}_2\text{O}_7/\text{MgO}$  at low temperatures is related to difficult electron transfer. The studies indicated the presence of a mobile center in the metathesis of olefins for oxide catalysts of all 3 title minerals, which is dependent on the chemical nature of the carrier and its crystalline structure. Figures 9; references 33: 8 Russian, 1 Bulgarian, 24 English. [219-12131]

## CHEMICAL INDUSTRY

### ELECTRONIC FILMING METHOD RECORDS ATOMIC MOTION

Vilnius SOVETSKAYA LITVA in Russian 13 Apr 82 p 2

[Article by V. Yel'makov: "A New Research Method"]

[Text] A film which was shot in a total of just 1 second in one of the scientific laboratories of Novosibirsk laid the basis for a new scientific research method. This unusual strip of film described the life of atoms in crystals.

Instead of the X-ray tubes used to photograph motionless atomic structures, scientists at the Academy City in Novosibirsk employed synchrotron emissions (born in accelerators) that were a thousand times brighter. By achieving such high illumination of the "filming stage," the scientists were able to film movements of atoms.

"The role of a motion picture camera is played in our research by a device capable of recording and transmitting 1,000 roentgenograms to a computer memory each second," explains scientist B. Tolochko of the Institute of Solid State Chemistry. This speed is sufficient to follow the movements of atoms in crystals and molecules of a substance undergoing deformation, heating or cooling, and in chemical reactions lasting fractions of a second.

Representatives of various sciences have displayed interest in the electronic movie. The new scientific research method is attracting more and more proponents. In the opinion of scientists, with time it may become an effective tool for developing more economical production processes in metallurgy, chemistry and other industrial sectors.

11004

CSO: 1841/229

LATVIAN STOCK BREEDERS TO RECEIVE MORE LYSINE ADDITIVE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 28 Apr 82 p 1

[Article by V. Volodin: "The Fruits of Cooperation"]

[Text] Latvian stock breeders understand the worth of a new biological additive to forage rations--lysine. After all, just 1 kilogram of this substance, when competently used in the feed of farm animals, can produce an additional 40-50 kilograms of meat.

Lysine is produced in the republic by the Livany Biochemical Plant. Its planned output has been doubled. Now stock breeders will receive hundreds of tons more lysine than planned from Baltic biochemists each year.

11004

CSO: 1841/229

## NEW VISCOSE FIBER LINE INSTALLED IN RYAZAN'

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 11 May 82 p 2

[Article by Correspondent V. Starostin: "Ryazan' 'Cotton'"]

[Text] The country's largest flow line producing high-modulus viscose staple fiber has been put into regular production at the Ryazan' Chemical Fiber Plant. Articles made from such fiber keep their shape excellently, and they are a time and a half stronger than ordinary staple fabrics; they are hygroscopic, and they combine within themselves the best properties of cotton and viscose fibers.

There was a short moment of silence in the spinning and finishing shop before the new flow line was started up, as if just before a long and hard road. The installers, adjusters and planners had gone, and only here and there along the line, which extended the entire length of the plant's bay could its future masters--the operators--be seen fussing with the equipment, getting used to the unusual and as-yet silent machine. All were anxious about one thing: How would the new machine unit make out in its first steps, in its trial run with a full production load?

And in front of it, the new line can expect a broad road--series production in industry and then work at plants producing cotton-like staple fiber. Of course the technical possibilities of the machine would have to be confirmed practically, and its planned capacity--40 tons of fiber per day--will have to be assimilated. This will not be an easy thing to do: Stiffer requirements are being imposed on the quality of the raw material, on the conditions of the production process and on the qualifications of the workers.

But today is a holiday, and we can understand what is going through the minds of the plant workers: The great and hard work of installation and adjustment has been completed, and the debates, doubts and searches for optimum decisions are behind. And each wants to see the result of his labor sooner, to hold in his hands that fiber with unusual properties, light like springtime down.

"The new flowline has a large number of fundamental advantages over existing staple machine units," said T. Aleynikov, chief of the production and technical division. "But the main thing is that this line will make it possible for us to achieve a qualitatively new level in production technology. It all has to do with a new extrusion method. Each separate fiber bundle is fully encapsulated, meaning that the

quantity of toxic substances entering the work zone is decreased by several orders of magnitude.

"I must admit that I was puzzled at first. I expected to hear the usual comparison of technical characteristics and the typical facts and figures, but here they say that the basic and most important advantage of the new line lies in the working conditions. Though I did spend some time in the work zone of operating machine units and persuaded myself through my own experience that this was in fact so, I still thought that this was not the main advantage. However, no matter whom I talked to at the plant, it was mainly this advantage of the new line--better working conditions--that was emphasized to me."

"As far as the technical characteristics are concerned," chief process engineer S. Umnova explained, "I should note that a flow line of such productivity is unique for the moment both here and abroad, and it is no accident that specialists from many countries are showing higher interest in it."

This brief statement clearly defines the general course of our economy toward intensification of production and growth in the unit output capacity of machines and machine units. Here at the plant, one can see its concrete embodiment with the unaided eye. In terms of surface area, the new line occupies a little more room than the existing machine units, but its productivity is almost twice greater. According to tentative estimates it will release 15 workers in the principal specialties--ones awaited in other sections, it will dramatically reduce the demand for water in the production process, and it will decrease losses of raw materials.

There is another important fact: The plant did all of the installing itself. And it not only helped the adjusters and planners, but it also participated in improving the design and utilizing the accumulated experience of operating similar machine units. Though the remarks of the plant workers, their proposals and the minor improvements they suggested were not earth-shaking, in the final analysis they did significantly improve the design. A. Zelenin, the leader of a brigade of fitters from the mechanical repair shop, assistant foreman I. Lupandin, section chief M. Seleznev and many other workers and specialists of the plant proved themselves to be thoughtful and creative specialists during the installation and adjustment of the equipment.

The other side of preparing the new line for operation--the organizational side--was described to me in detail by the plant director, V. Prodan. I found that all specialists had thoroughly studied the new production process using an experimental stand at the plant. The workers underwent special technical training, and the shifts will work according to the new brigade form of labor organization and stimulation.

"The new flow line is a prototype of future plants producing cotton-like fiber in our country," Vasilii Vasil'yevich Prodan said with conviction. "I would hope that our experience in installing and adjusting the line without interrupting production and maintaining close creative cooperation between Leningrad planners, Pskov machine builders and the operators--would be utilized by other enterprises. After all, it opens up new possibilities for developing production of a valuable raw material with improved output capacities at low outlays."



The first batch of viscose high-modulus fiber was recently obtained. Now the plant's collective faces a new important task--raising the output capacity of the highly productive machinery to its planned level faster, and providing textile workers with raw material from which to make practical and strong fabric similar to cotton.

11004

CSO: 1841/229

# UKRAINIAN SSR CHEMICAL INDUSTRY: PROSPECTS FOR DEVELOPMENT ANALYZED

Kiev EKONOMIKA SOVETSKOY UKRAINY in Russian No 2, Feb 82 pp 14-18

[Article by V. Kostenko, section chief, Ukrainian SSR Gosplan]

[Text] Chemical materials and chemical production methods have always played an important role in the development of productive forces and in the satisfaction of the society's material needs. This is why chemical industry, the basis for the national economy's chemicalization, defines the country's economic potential to a significant degree. It may be said without exaggeration that no important scientific-technical, economic and social problems can be solved today without the use of chemical materials and products or chemical technology. Thus the food program requires an increase in the production and creation of new forms of mineral fertilizers and chemical plant protection resources, feed additives, preservatives, various films and other chemical materials and chemicals; the development of space requires ultrastrong materials; the problem of protecting the environment requires new chemical production processes. The degree to which we can raise labor productivity and make working conditions easier, especially for women, depends in many ways on the level of development of household chemistry.

It was precisely on the basis of this definition of the role and place occupied by the sector that the 25th and 26th CPSU congresses emphasized the need for preferential development of chemical industry and for constant improvement of its structure.

Significant successes were achieved in development of chemical industry in the 10th Five-Year Plan. Deliveries of mineral fertilizer to agriculture were more than 30 percent higher than in the previous five-year plan. Production of plastics, chemical fibers and filaments, paint and varnish products, consumer chemicals and other articles increased significantly. In terms of chemical production volume, our country now holds first place in Europe and second in the world.

The Ukrainian SSR's chemical industry, which is developing in accordance with a unified national economic plan with a consideration for both all-union interests and the need for the integrated development of the region's productive forces, is making a major contribution to raising the effectiveness of the country's social production.

The Ukraine now produces almost a fifth of the country's chemical products (by volume), about 49 percent of its sulfur, 14 percent of its caustic soda, 23 percent

of its soda ash and 44 percent of its white pigments. Natural sulfur, titanium dioxide, photographic materials, synthetic dyes and other items are obtained here for countrywide use. During the five-year plan the proportion of chemical and petrochemical products in the total industrial production volume of the Ukrainian SSR increased from 5.9 percent in 1975 to 6.5 percent in 1980. During this period the sector's production of commercial goods increased by more than 30 percent.

In the last five-year plan the sector witnessed a construction program of sizeable scale, as a result of which new productive capacities were placed into operation and existing ones were expanded and rebuilt. More than 3.5 billion rubles of capital investments were assimilated, making it possible to increase fixed productive capital by almost 1.6 times in comparison with the Ninth Five-Year Plan. Among the facilities created in the 10th Five-Year Plan are large carbamide production complexes at the Gorlovka "Stirol" Production Association and in the Cherkassy and Dneprodzerzhinsk "Azot" associations, and highly productive sulfuric acid production facilities at the Sumy "Khimprom" Association, the Rozdol "Sera" Association and the Konstantinov Chemical Plant. Capacities able to extract 1 million tons of natural sulfur have been created at the Yavorov "Sera" Association. The largest facilities of the five-year plan, created on the basis of compensatory contracts having important significance to international economic ties, include the Odessa Portside Plant, an ammonium pipeline connecting Gorlovka to the Odessa Portside Plant, and a polyethylene production complex in Severodonetsk.

As was foreseen in the 10th Five-Year Plan, while an absolute increase occurred in chemical production volume, preferential development was enjoyed by those forms of production which promoted the most effective growth of social production: mineral fertilizers, plastics and chemical fibers and filaments.

Production of plastics and synthetic resins increased during this period by more than 1.8 times due to introduction of polyvinyl chloride resin and polystyrene production operations at the Dneprodzerzhinsk "Azot" Association, a polyvinyl chloride resin operation at the Pervomaysk Chemical Plant and a polyethylene operation at the Severodonetsk "Azot" Association. The output capacities of the Cherkassy and Zhitomir chemical fiber plants and the Chernigov "Khimvolokno" Association have been increased.

Much work was done to develop production of mineral fertilizers, chemical plant protection resources, feed additives and other chemicals needed by agriculture with the goal of its further chemicalization. During the five-year plan output capacities producing 4.9 million tons of mineral fertilizers and 20,500 tons of chemical plant protection resources were placed into operation; large facilities producing raw materials for mineral fertilizers--ammonium, sulfuric acid and nitric acid--began putting out their products. Capacities capable of producing 1.32 million tons of feed phosphate per year were created in the republic. Concurrently with increasing production volume, measures were implemented to upgrade the quality of mineral fertilizers and expand their assortment. In comparison with 1975, the proportion of mixed concentrated fertilizers increased in relation to the total production volume, and the amount of their useful ingredient was enlarged.

A great deal of work was done to expand and reequip enterprises of the soda and bromine subsectors. In petrochemical industry, further development was enjoyed

by the output capacities of the Belaya Tserkov' Tire and Industrial Rubber Article Association, the Dnepropetrovsk "Dneproshina" Association, the Sumy Industrial Rubber Article Plant, the Kremenchug Industrial Carbon Plant and others.

Much attention was devoted in chemical industry to production of cultural, personal and household goods. Production of various consumer goods was organized at 65 enterprises (out of 85) of the Ministry of Chemical Industry by the end of the five-year plan: photographic chemicals, synthetic laundry detergents, plastic and chemical fiber articles, cosmetics and personal chemical goods--a total of over 400 different items. Enterprises of the Ministry of Chemical Industry and the Ministry of Fertilizer Production produced 665 million rubles worth of such goods in 1980.

A large quantity of major conservation measures have been implemented in both chemical and petrochemical industry.

However, evaluating what had been done in the past five-year plan, we should note that the successes might have been incomparably greater, had better use been made of the existing output capacities, and had new shops and facilities been built and assimilated more quickly.

Thus because of restrictions on phosphorus availability, a number of phosphate fertilizer and feed additive production operations had to work below peak volume. The polyethylene production complex at the Severodonetsk "Azot" Association never achieved stable operation in connection with the fact that the ethylene facility of the Lisichansk Petroleum Refinery has been slow in reaching its full output capacity. There are other examples of slow assimilation of introduced capacities as well.

A low pace of construction and delays in solving planning problems and providing equipment resulted in the fact that some soda ash, titanium dioxide and chemical fiber output capacities were never placed into operation; chemical facilities at which construction has been dragging on for a long period of time include the Sivashskoye Aniline Dye Plant, the caprolactam production operation at the Cherkassy "Azot" Association, the Pervomaysk Chemical Plant and a number of others.

The 26th CPSU Congress defined the new prospects for development of chemical industry. The great socioeconomic and technical problems facing the country in the 11th Five-Year Plan and in the future cannot be solved without significant development of chemical industry. We must strengthen and expand the sector's raw material base and raise the effectiveness of its subsectors by introducing improved equipment, highly productive catalysts, and wasteless and low-waste production processes.

During the 11th Five-Year Plan the Ukraine's chemical industry must satisfy more fully the local demand for mineral fertilizers--to support development of the agroindustrial complex, for plastics--to support machine building and construction, and consumer chemicals--for the public.

In 1981-1985 the republic is to enjoy a further increase in mineral fertilizer production capacities. Steps will be taken to raise the quality and expand the assortment of mineral fertilizers. In 1985, mineral fertilizer production is to climb to 26 million tons, in comparison units (32 percent more than in 1980). Preferential development will be experienced by production of mixed and concentrated fertilizers; their output will be increased by 1.6 times in the five-year plan. This will

require introduction of output capacities producing nitroammofos at the Rozdol "Sera" Association, carbamide at the Severodonetsk "Azot" Association, and others.

Much work will have to be done to develop sulfur production, primarily at the Yavorov "Sera" Association. Geological exploratory and preparatory operations of significant volume will be performed with the purpose of organizing sulfur mining at the Zagaypol'skiy deposit in Ivano-Frankovskaya Oblast, and at the Gremnovskiy deposit in L'vovskaya Oblast.

During the current five-year plan the output capacities of distributing stations along the ammonium pipeline between Gorlovka and the Odessa Portside Plant is to be increased, and liquid ammonium storage and distributing stations are to be built in some of the agricultural rayons. This will make it possible to increase the scale of the republic's use of liquid ammonium as fertilizer. By the end of the five-year plan the proportion of concentrated and mixed fertilizers in relation to total production should increase to 82 percent.

Growth in production volume and in deliveries of concentrated and mixed fertilizers will doubtlessly promote reduction of labor outlays in agriculture and an increase in the coefficient of fertilizer use. But before this could be achieved, a large amount of work will have to be done in both chemical industry and agriculture during the next 5-10 years: The tendency of fertilizers to cake will have to be corrected, a uniform granule size will have to be achieved, the network of manure mixing facilities and storage sites will have to be widened, and the volume of unpackaged fertilizer shipments will have to be increased significantly.

The use of fertilizer will become effective only in the event that an optimum relationship is reached between the use of fertilizers and chemical plant protection resources. New operations producing chemical plant protection resources--hexachlorobutadiene and (polikhom) in particular--are to be built during the five-year plan, and existing operations are to be expanded. A significant proportion of the chemical plant protection resources will be supplied to the Ukraine from other republics and CEMA countries.

The high rate of development of plastic and synthetic resin production operations will continue into the 11th Five-Year Plan. By 1985, production of these articles is to increase by almost 1.6 times. New output capacities are to be placed into operation at the Cherkassy "Azot" Association, at the Rubezhnoye "Krasitel'" Association, at the Borislav Chemical Plant and elsewhere. There are plans to expand production of chemicals imparting different properties to plastics and increasing the strength and life of articles made from them.

Efforts to develop production of chemical fibers will continue. Their output will be increased by 20 percent in 1985; this will be coupled by an improvement in the production structure and an increase in the strength and elasticity of synthetic filaments intended for industrial purposes. It is with this purpose that an operation producing cord fabric to be used in the manufacture of oversized tires will be organized at the Chernigov "Khimvolokno" Association, and that new capacities producing modified and textured filaments will be placed into operation at the Zhitomir Chemical Fiber Plant. There are plans for producing up to 30,000 tons of such filaments in 1985. The capron production operation of the Kiev "Khimvolokno" Association is to be rebuilt and converted to production of braid for carpet.

To save on cotton, a viscose surgical cotton production operation will be created at the Sokal' Chemical Fiber Plant.

There are plans for a major effort to develop capacities producing dyes and auxiliary substances for textile industry. In particular the output capacities of the Sivashskoye Aniline Dye Plant are to be assimilated beginning in 1984, and new output capacities will be built and placed into operation at the Ivano-Frankovsk Precision Organic Synthesis Plant. Reconstruction and reequipment of many shops of the Rubezhnoye "Krasitel'" Association will begin. Further reconstruction and expansion of the Lisichansk and Krymsk soda plants and introduction of a major caustic soda production operation at the Kaluga "Khlorvinil" Association will promote further growth in production of soda products.

The 11th Five-Year Plan turns special attention to developing consumer goods production. Completion of this task will be promoted by construction and commissioning of facilities such as the household chemicals shop at the Rubezhnoye "Krasitel'" Association, a paint and varnish shop at the Sumy "Khimprom" Association and at the Donetsk Chemical Plant, a plastic articles plant at the Gorlovka "Stirol" Association and a synthetic laundry detergent production operation at the Vinnitsa Chemical Plant. Much work will be done to expand production of chemical products at the Shostka "Svema" Association and at a number of others.

Production is to be significantly expanded at the republic's petrochemical industry enterprises in 1981-1985. There are plans for expanding output capacities of the Belaya Tserkov' Tire and Industrial Rubber Articles Association and at the Sumy Industrial Rubber Articles Plant, and to place the Gorlovka Rubber Footwear Plant, specialized in the production of special footwear, into operation. Construction of Tire Plant No 2 is beginning in Belaya Tserkov'. Its first output capacities are to be placed into operation in 1985-1986.

Reducing the proportion of materials and energy required by chemical production is an important problem associated with raising the effectiveness of the work of the sector and of each enterprise. This reduction is to be achieved by improving production processes, decreasing the relative outlays of energy and thermal power, intermediate products and raw materials, by subjecting materials to deeper and fuller processing and by making maximum use of secondary resources.

Production increased at all existing enterprises during the 10th Five-Year Plan practically without increasing the number of workers--by raising labor productivity. Production will be increased during the 11th Five-Year Plan in the same way. This will be possible owing to the fastest possible assimilation of new production processes and highly productive equipment, automation of production, mechanization of auxiliary processes and improvement of the work of repair services.

Solving the problems of protecting the environment from pollution is a prerequisite of the development of enterprises in chemical and petrochemical industry. This is why significant capital outlays will be allocated in the current five-year plan to environmental protection, including to introduction of low-waste and wasteless production processes.

Fulfillment of the tasks facing the sector requires effective use of all forms of resources, an active search for reserves, and selfless labor by all workers of the industrial enterprises and the scientific research and planning organizations. Only by mobilizing all efforts of the laborers in the sector can we ensure growth of the sector's technical level, improvement of the effectiveness and quality of its work and successful fulfillment of the tasks posed to chemical industry by the 26th CPSU Congress.

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11004

CSO: 1841/237

## CHEMICAL INDUSTRY PRODUCTION UP

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 30 May 82 p 1

[Text] There is good reason for calling chemistry multifaceted. Synthetic materials are enjoying increasingly broader use in all spheres of the economy and in the daily lives of people. Polymers with prescribed properties, chemical fibers and filaments, synthetic rubber, washing agents, dyes and medicinal preparations--all of these and many other necessary things are provided to us by the most important sector of modern industry. Chemicalization of the national economy is opening up broad possibilities for raising the effectiveness of production and hastening the rate of scientific-technical progress.

Chemistry is playing a special role in intensification of agriculture. Responding with action to the decisions of the May Plenum of the CPSU Central Committee, laborers of mineral fertilizer industry are increasing production of "fertility vitamins" and plant protection resources, and they are attempting to make an honorable contribution to implementing the USSR's Food Program.

A competition for an honorable welcome to the 60th anniversary of the USSR's formation and for predeadline fulfillment of the quotas of the five-year plan's second year has assumed broad scope at enterprises of chemical industries these days. Chemical, petroleum refining, petrochemical and microbiological industry surpassed the planned quantity of products provided to the country by tens of millions of rubles. Hundreds of brigade, section and shop collectives and many thousands of laborers reported completion of the first semiannual program at the eve of their professional holiday.

11004

CSO: 1841/239



## OIL MINISTER SUGGESTS DEEPER REFINING AS ECONOMIZATION MEASURE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 30 May 82 p 2

[Article by USSR Minister of Petroleum Refining and Petrochemical Industry  
V. Fedorov: "Oil: Don't Burn It, Refine It"]

[Excerpts] As in previous years, the country's petroleum refining and petrochemical industry is developing stably and at a high rate in the present five-year plan, in accordance with decisions of the 26th CPSU Congress. The countenance of the sector is defined today by modern production systems capable of high unit output, by progressive, highly productive equipment and by a broad assortment of valuable products and basic raw chemicals obtained from petroleum. The positive changes occurring in the production structure have revealed themselves more definitely. Preferential growth is now ensured for production of high octane gasolines, low sulfur diesel fuels, lubricating oils with additives, new forms of synthetic rubber replacing natural rubber, and longer-life radial motor vehicle tires. A noticeable step forward has been made in raising production effectiveness and improving work quality in all units of the economic mechanism.

Decisions of the party Central Committee plenum held this week and the deeply grounded report given by CPSU Central Committee General Secretary Comrade L. I. Brezhnev, which defines the basic paths of implementing the Food Program, evoked a new upsurge in the creative efforts of the labor collectives. The party's appeal to make sharp improvement of the economy's agrarian sector the most important task of all the people has enjoyed avid support at petroleum refining and petrochemical enterprises producing the most diverse products for farmers.

According to the results of the first 4 months and of the first half of May, our ministry's enterprises have fulfilled their pledges associated with delivering products to agriculture. The plants and associations are now searching for new reserves for increasing the output of such products with the purpose of making the sector's contribution to fulfillment of the Food Program even more substantial.

While noting what we have done, we must at the same time take notice of the serious shortcomings in the work of our industry, especially in regard to capital construction, introduction of the achievements of science and technology and improvement of the style and methods of control. Not all enterprises are fulfilling their planned quotas and their contracts for delivering finished products. The fastest possible solution of these problems will make it possible to improve the use of the sector's enormous productive potential.

The most important task of both the current five-year plan and of the future continues to be that of raising the effectiveness with which petroleum is used. The urgency of this problem is elicited, on the one hand, by a significant increase in public outlays on petroleum extraction connected with a shift in the location of the main extracting base into remote regions of Siberia and the North, and on the other hand by swift growth in the national economy's demand for motor fuels, lubricants and other petroleum products. Today, petroleum is also an irreplaceable source of raw materials used in the production of plastics, rubber, synthetic fibers, washing agents and many, many other chemical and petrochemical products.

The residue from primary distillation--fuel oil--may be used successfully as an additional raw material in the production of a broad range of motor fuels and other scarce petroleum products. By subjecting it to secondary refining we can reduce consumption of petroleum to produce every ton of motor fuels by more than a time and a half. Given today's scale of production, this would be equivalent to a real savings of tens of millions of tons of "black gold."

Today's Soviet industry enjoys a sufficient scientific-technical foundation from which to reorient the sector toward intensive use of crude petroleum based on its deeper refining. The first steps in this direction have already been made. Complex combined "GK-3" systems, which have made it possible to increase the yield of high quality light petroleum products from West Siberian petroleum to 70 percent, are now operating at the plants in Angarsk and Kremenchug. Catalytic systems are successfully subjecting petroleum to deep refining at Omsk, Ufa and Ryazan'.

The positive results achieved in operating these facilities were the basis for developing even larger second-generation systems, in which primary and secondary refining have been combined into a single complex. Such a system is essentially represented by an independent plant. The advantage of such giants is that one complex of this sort can produce the entire assortment of petroleum products and that the need for erecting separate facilities intended for a narrow assortment of goods is eliminated.

We plan to build five such high capacity systems in this five-year plan. Two of them will go into operation very soon--the ones at the Moscow and Pavlodar petroleum refineries.

A long-range program for raising the effectiveness with which crude petroleum is used in the country's principal petroleum refining centers has been developed. For example an integrated program for fundamentally rebuilding the Baku refineries foreseeing a significant increase in the depth of petroleum refining has been approved in the Azerbaijan SSR. Similar decisions have been made in the Kazakh SSR, the Bashkir ASSR and other regions. Implementation of these measures will make it possible to obtain an additional 10 million rubles worth of motor fuels, raw chemicals and other valuable products from the same quantity of crude petroleum by the end of the five-year plan.

The scientific research and planning organizations of the USSR Ministry of Petroleum Refining and Petrochemical Industry and the Ministry of Chemical and Petroleum Machine Building have done a great deal to create highly productive equipment and effective processes for petroleum refining. But sometimes the work is not carried

out at the required level, and new equipment often fails to meet modern requirements of economy and reliability, making it difficult to introduce progressive technology. The contribution made to the solution of these problems by sector and academy institutes must be significantly enlarged, and creative cooperation between scientific research and planning organizations and the industrial enterprises must be made closer and more productive.

Implementation of our plans for sensible use of crude petroleum will depend to a decisive extent also on what quantity of heavy petroleum residues we will be able to subject to further refining. We must develop a specific-purpose integrated program foreseeing successive and consistent reduction of the proportion of fuel oil used as fuel and its substitution, where possible, by coal, gas and combustible shale.

Thus far, the plans for production and capital investments have been written and the other base indicators have been developed for two inseparably associated subsectors--petroleum refining and petrochemistry--by two sector divisions of the USSR Gosplan: the petroleum and gas industry division and the chemical industry division. This situation produces various inconsistencies in planning and violations of the proportions existing within the sector. It seems to me, therefore, that it would be suitable to create, within the structure of Gosplan, an independent division of petroleum refining and petrochemical industry. This would promote clearer coordination in efforts to complete the task proposed to the sector by the 26th party congress.

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CSO: 1841/239

UDC 532.566.06.20.98

CURRENT STATUS OF PROCESSES AND EQUIPMENT IN CHEMICAL TECHNOLOGY

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 82  
(manuscript received 2 Jun 81) pp 50-56

RIZAYEV, N. U., Institute of Textile and Light Industry

[Abstract] This is a review of developments related to automatic control systems in chemical technology and the transition from experimental to production applications of new advances, stressing the need for articulating accurate mathematical models that will contribute to efficient computer control of operations. Operations mentioned include transmission of liquids and gases, pulsation methods and the use of mechanical and magnetic fields, plasma chemistry installations, radiation chemical processes involving nuclear radiation, ion exchange processes in producing acids, salts and highly pure substances, and particularly ion exchange synthesis in dynamic conditions, for which a coefficient of mass exchange is developed. This theory was tested in a weak polar medium of alcohol and water for concentrations of  $H^+$  ions. Results indicated that increased concentrations of the organic solvent, which decreased polarity, brought a divergence between theoretical and experimental values, for the mechanism of the process changed into common adsorption of reacting substances. Other ion exchange processes involved regenerating engine oil, where the preferred process was determined to involve engine oil rather than benzene solutions that required expensive filtration. Theoretical methods using LaGrange multipliers, linear programming, non-linear optimization and variational principles were confirmed by experiments. Such a task was presented by determination of resistance in mass transfer to be used in complex chemical production systems. Figures 3; references 3 (Russian).  
[208-12131]

## COAL GASIFICATION

UDC 662.75 : 542.91

### SYNTHETIC LIQUID FUELS: PAST, PRESENT, FUTURE

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 1, Jan 82 pp 123-133

LOKTEV, S. M., doctor of chemical sciences

[Abstract] The author summarizes efforts to produce synthetic fuels that began early in this century with attempts to convert coal, oil shale and wood into liquid hydrocarbons. Early practical results came in the Ruhr in 1912-15, and later in Nazi Germany. The first Soviet efforts were undertaken by the State Institute of High Pressure Technology in Leningrad and the All-Union Scientific Research Institute of Liquid Fuels and Gas in Moscow, in the mid-1930s. Wartime needs brought new urgency to synthetic fuel production, with the main efforts directed toward hydrogenation. The Fischer-Tropsche synthesis from CO and H<sub>2</sub> at 1 at. produced 60% benzine of about 50 octane, 30% diesel fuel and 10% paraffin. Such products enabled Germany to pursue its warfare, despite its lack of domestic crude oil. After the war some synthetic fuel production continued, but the real interest followed the oil shortages and the realization of dwindling world supplies in 1973. With greatly increased prices, synthetic fuel production became economically attractive. In the USSR, the Energy Institute imeni G. M. Krzhizhanovsky has worked on experimental production of a semi-coking-high-speed pyrolysis process, to be used to process Kansk-Achinsk brown coal into annual production of 300,000 tons of semi-coke, 120 million cubic meters of gas for electric power stations, and 100,000 tons of synthetic resin. Hydrogenation has been improved to accomplish initial gas liquefaction at the Institute of Combustible Minerals. The Mobil Process has been developed to replace the Fischer-Tropsche one to produce high octane benzine by dehydration from coal using zeolitic catalysts of methanol. Costs of synthetic fuels remain high, but efforts to improve that factor continue in the USSR and elsewhere.

[206-12131]

## FERTILIZERS

### STATUS OF CHILISAY PHOSPHORITE MINE

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 9, Sep 81 pp 51-53

[Article by V. Rogozhin: "Chilisay Today and Tomorrow"]

[Excerpts] The Aktyubinsk phosphorite basin has long been known. It was discovered back at the end of the last century by a Russian geologist, Academician F. Yu. Levinson-Lessing. Though not entirely successful, the first attempt at estimating the phosphorite reserves was made 15 years later.

Aktyubinsk phosphorites were subjected to further rather productive study in the 1930s. The Kandagach deposit was explored, and the Koktyubinskoye and Talaspayskoye deposits were studied and evaluated. The Zolotonosha, Bogdanovka and Novoukrainka deposits and the Tamdinskiy and Terek-Say sites were discovered north of Kandagach (presently the city of Oktyabr'sk).

At the same time a prospecting party from the fertilizer institute calculated the reserves of the Bogdanovka and Novoukrainka deposits under the guidance of B. M. Gimmel'farb. An experimental plant of the fertilizer institute conducted research on concentrating Bogdanovka and Kandagach phosphorites. The positive results of this research served as the basis for building a mineral fertilizer production combine in Aktyubinskaya Oblast.

It must be admitted that the present Chemical Plant imeni S. M. Kirov in the city of Alga was not located at the best phosphorite deposit. Requiring concentration, the poor ore made mineral fertilizer production unprofitable, and soon the former Aktyubinsk Chemical Combine was converted to production of phosphate fertilizers using a richer raw material--apatite from Khibinsk.

The question of utilizing the Aktyubinsk basin was raised again in the 1960s. On one hand it was one of the country's most promising suppliers of phosphate fertilizers, while on the other hand its utilization would promote sensible distribution of extracting and processing capacities.

Creation of a mine and a phosphorus fertilizer plant was planned at the Bogdanovka deposit in 1959. In this connection Aktyubinsk geologists did a great deal of prospecting and sampling. New prospecting methods and improved analysis methods made it possible to reveal a number of new deposits. Geologists discovered the Chilisay deposit, and then the Verkhne-Karagandinskoye, Karaganda, Shibayevskoye, Luga, Temreyskoye and Shulakskoye deposits. This completed the initial evaluation of the central part of the Aktyubinsk basin.

The Chilisay deposit, the total reserves of which were estimated at 1 billion tons, was recognized to be the most promising. Ore containing phosphorus anhydride exists as a solid layer, not very deeply buried. This encouraged Aktyubinsk geologists to ask the USSR Minister of Geology to accelerate efforts to evaluate the Chilisay deposit. A suggestion was made to locate a mine not at the Bogdanovka deposit, where prospecting revealed only 80 million tons of phosphorites, but rather at the Chilisay deposit. In 1972 the USSR Ministry of Chemical Industry adopted a decision calling for priority development of the Chilisay deposit.

A year later the field work was finished. Scientific research on concentrating the ore from the Chilisay deposit, improving the production processes and making its extraction economically more effective was conducted concurrently. It was carried out by scientists of a number of all-union and republic scientific research institutes. The results showed that the local raw materials should be used extensively in the production of mixed fertilizers.

Geologists of western Kazakhstan discovered a total of 40 deposits with total predicted reserves of 3 billion tons. This put the Aktyubinsk phosphorus basin in third place in the country. On 13 August 1975 a traveling session of the USSR Council of Ministers State Reserves Commission confirmed the reserves of the Chilisay deposit at 1,577,000,000 tons, of which 1,150,000,000 tons were balance reserves, to include 658,000,000 tons in the industrial category.

Such was the start. A mining and concentrating complex with an annual productivity of 1.4 million tons of phosphorus concentrate per year has been under construction at the Chilisay deposit since 1974. The first part of the complex's first generation, which is to have an output of 700,000 tons, is to go into operation in 1985, and the entire first generation will be working by 1988. Then the productive capacities are to be doubled, raising them to 2.8 million tons of concentrate per year. The balance reserves of phosphorite ore should keep the enterprise operating at this output capacity for 100 years.

The enterprise will include quarries and a complex of processing, subsidiary, auxiliary and maintenance shops. The deposit is to be worked as an open pit by a combined system.

Mining operations will be performed with walking excavators, scrapers, draglines and other excavating and earth-moving equipment. Blending depots have been foreseen at each quarry for the purposes of averaging out the qualities of the ore in terms of harmful and useful components. Ore will be delivered to these depots by BelAZ-540A dump trucks, and from them it will be carried to the receiving hoppers of the concentrating factory by rail. The phosphorite ore processing flow chart foresees two basic processes--washing, together with separation of washed concentrates, and flotation, which can raise the concentration of phosphorus pentoxide in the concentrate to 24 percent.

Representatives of four contracting and 25 subcontracting organizations are building the mine. The general contractor is the recently created "Chilisaytyazhstroy" trust. About 250 plants and 20 of the Soviet Union's planning organizations are supplying equipment and documents to Chilisay.



These plants include giants such as the Kama Motor Vehicle Plant, the Novo-Kramatorsk Heavy Machine Building Plant and enterprises of Moscow, Novosibirsk, Minsk, Irkutsk, Tashkent, Alma-Ata and many other cities.

The Moscow "Gosgorkhimproyekt" Institute is planning the entire mine complex with the assistance of subcontracting organizations. Documents to support construction of approach routes are being prepared by the "PromtransNIIproyekt" in Novokuznetsk, Odessa's "Giprosvyaz'" is taking care of communications, Alma-Ata's "Energosel' proyekt" is planning the boiler rooms, Aktyubinsk's "Kazzapsel' proyekt" is planning the miners' city, and Alma-Ata's "Kazgiprotorg" is developing the department of workers' supply, construction of which will be completed this year.

The All-Union "Soyuzgorkhimprom" Association, which represents the mine's board at the construction site, is dealing with all problems associated with construction at Chilisay.

Many things have slowed construction down, but the main problems were absence of a local construction industry base, lack of housing and, as a consequence, a shortage of workers, especially skilled ones.

The lost ground of the first years is still having an impact today. During the time that the mine has been under construction, the total amount of construction and installation jobs completed has been a little more than 46 million rubles, while the plan foresaw assimilation of a time and a half more--72.6 million rubles.

But now the "Chilisaytyazhstroy" trust and the construction industry base have grown stronger, and commercial concrete and asphalt-concrete plants and a complex of repair facilities of the construction mechanization administration have been built. Fully equipped housing has attracted qualified specialists to the construction site. The turnover of young personnel has decreased significantly.

The plan for assimilation of capital investments has been completed ahead of schedule in the last 2 years. Construction is growing in scope and rate. Last year for example, 16.2 million rubles worth of general contracting jobs had to be assimilated. The quota was surpassed by 1,563,000 rubles.

The rate of commissioning of fixed capital has grown significantly. Fixed productive capital worth 873,000 rubles was introduced in 1979. Last year this number increased by almost four times to 3,321,000 rubles. The proportion of unfinished construction has decreased significantly. Now the mine's board of directors and the builders of the mining enterprise are concentrating all of their attention on completing the construction starts of the 11th Five-Year Plan and on placing them into operation on schedule.

A microdistrict reserved for Chilisay's builders in the southwest quarter of the city of Oktyabr'sk is growing quickly. Multistory residential buildings have risen in a place where there was nothing but barren steppe until quite recently. The apartments now have hot water, communication lines have been laid, and there are now stores and a nursery school.



Next to it is a microdistrict of single-story buildings--one- and two-apartment houses with private plots and yard buildings. It has its own stores and nursery school. Regular bus service connects it to the city.

The Chilisay phosphorite mine presently consists of an experimental concentrating factory, a mining section, a transportation shop, a nonstandard equipment section, a power engineering service, boiler rooms servicing the industrial facilities and the microdistrict, a substation, a section dealing with monitoring and measuring instruments and automatic equipment, and a municipal and housing services office.

Construction is growing and expanding, and the creativity of the miners is increasing. Last year the economic impact from introducing new ideas was 152,000 rubles. The turnover among highly qualified specialists has decreased in all units of the experimental concentrating factory and the mining and motor transportation shops. Labor and production discipline has improved.

One of the most important components of the mine is the experimental concentrating factory. It was placed into operation in December 1977. In 1978 it produced its first lot of phosphorus concentrate, containing 7.5 percent phosphorus pentoxide. This was an achievement.

Ore from the Chilisay deposit is dominated by sandy phosphorite nodules. The quality of phosphorite meal produced from this raw material did not satisfy the requirements because the ore concentrating procedures had not yet been worked out. Only an experimental concentrating factor could help solve the problem. The young collective managed to solve it.

The ore concentrators successfully completed the program for 5 months of the first half-year of the 11th Five-Year Plan. The washed concentrate production plan was 102.7 percent completed, the sales plan was exceeded by 1.3 percent, and labor productivity grew by 2.6 percent.

The factory also performs another function. It has become a training school for personnel for the production and repair and technical services. Here they learn to use the machinery and apparatus employed at similar mining and concentrating enterprises.

But this is all just the beginning. The workers of Chilisay still face many problems.

An optimum process for working the ore in winter must be found, and solutions must be found to water supply and a number of other problems. They must be solved right now. Time does not wait. Agriculture's demand for mineral fertilizers is growing with every year. Chilisay knows and remembers this. The builders, planners and miners are all working together to get the mine working sooner.

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11004

CSO: 1841/236

## DISORGANIZATION SLOWS CONSTRUCTION OF NOVO-SOLIKAMSK POTASSIUM PLANT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 15 May 82 p 1

[Article by ZVEZDA Correspondent I. Vikhnin: "From Report to Report"]

[Text] Erection of a potassium giant--the Novo-Solikamsk plant, which will produce up to 4 million tons of fertilizer salts per year--is the main task of the collective of "Glavzapaduralstroy" Trust No 8 in the present five-year plan. The first generation of the enterprise, which will have an output capacity of 900,000 tons of fertilizers, is to go into operation this very year. Clear organization of competition and coordination in the actions of builders and installers are more important today than ever before. How are things really going at the construction site?

The lunch break had ended 10 minutes before, but we missed the installers at their workplace. We found them in the brigade break car. This was more than strange. They, after all, the installers from "Uralstal'konstruktsiya" trust are the perpetual targets of unkind words from the builders for being behind schedule.

Yes, brigade leader L. Sedel'nikov agreed, they have not been able to keep up with the schedule, and it was about time they started working with full energy. But it was the builders of Trust No 8 that were at fault, since by not preparing the foundations for the metallic structures, they were keeping things from getting started.

"It's such a waste of time here," confirmed V. Kondrakov, the deputy chief of the plant's capital construction division.

"That's exactly what it is, a waste of time. It's so crowded here that installers and builders can't work together at the same time. People working on associated jobs should be placed in different shifts. But no one seems to want to solve this simple problem."

We went next door to the building atop shaft No 2. Half an hour had already passed after lunch. But the carpenters and concrete layers had not yet gone to work. Foreman A. Abdulin of Construction and Installation Trust No 5 did not even try to debate the fact: Things were going badly. They were already so far behind schedule that the brigade had to surpass the norm by a minimum of 20 percent.

The mining complex of the Novo-Solikamsk Potassium Plant was supposed to have gone into operation last year. The trust's main objective was to complete all of the complex's 30 facilities, including the mine shafts. The builders were unable to handle the planned work volume. Nor had things improved in the first quarter of the present year. In 3 months 56 percent of the planned quota had been completed. Shaft No 2 had already been dug long ago. It was accepted by the workers' commission. And it is not operating yet simply because the trust's subdivisions are unable to complete construction of the above-ground structures.

Clearly, poor work organization is a hindrance to pledge fulfillment. I leafed through resolutions published by operational conferences conducted at the construction project's headquarters by trust director N. Ivanov. Categorical prescriptions adopted by the chiefs of the trust's subdivisions--"completing..., preparing for installation..., resolving the issue..."--kept reappearing from one conference report to the next.

"True," agreed G. Polyakin, the trust's party committee secretary, "some subdivision executives are being outright irresponsible...."

"What are you doing to influence them?"

"We criticize them at the conferences and in our high-volume newspaper."

Criticism is, without a doubt, a strong tool. But power must also be used against those who do not listen, and who do not make the proper conclusions.

There are examples of a totally different approach to the work here as well, at the Novo-Solikamsk construction site. Take as an example the collective of the Bereznikov Mine Construction Administration. When miners receive a mineshaft from it, it is usually totally ready to go. And it is not until everything is completed that the miners begin their own efforts in the mine. But this was not the way things went at this construction site. Realizing that their associates were hopelessly bogged down in their own operations, the mine builders decided not to wait. Within a few weeks they dug out the ventilation connector joining shafts No 1 and No 3, and they laid about a thousand meters of drifts. Owing to this the mining operations were started immediately after shaft No 3 was completed. The time gain was 3 months.

Specialists of the "Uralkhimmontazh" trust found an original way to speed the work up in the main building. Without waiting for the foundations, the installers began installing flotation machines on temporary supports. And they are doing all this with high proficiency, gradually making up lost time not of their doing. In precisely the same way, without waiting for construction to be fully completed, they began installing the straight sections of the pipelines.

Comparing the work of associates and of the general contractor, one comes to the conclusion that it would be nice for the latter to borrow from the experience of its subcontractors in providing engineering and organizational support to the competition.

## LACK OF RAIL CARS BLAMED FOR DETERIORATION OF STORED CARBAMIDE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 16 May 82 p 2

[Article by V. Yapparov, senior instrument controller, member, Salavat City CPSU Committee: "To the Warehouse Rather Than the Field"]

[Text] Our carbamide plant, which is within the composition of the "Salvatnefteorgsintez" Production Association, is behind by 47,000 tons in its deliveries of mineral fertilizers to consumers. It is extremely important to introduce carbamide into the soil in spring, and later on as well, during top-dressing of crops. One can understand the impatience with which our products are awaited by grain farmers of the Kirghiz SSR, Kazakhstan and Volgogradskaya, Rostovskaya and other oblasts of the country, to which we were unable to deliver them on time.

Could it be that this failure is just bad luck? It is not, and that is where the problem lies. Our association, which added large capacities producing mineral fertilizers a few years ago, has long been having difficulties in unloading its products. Some of the consumers have even stopped troubling the enterprise with telegrams and letters: They know that nothing would come of it anyway. The plant's planning division offered this figure: Last year we received 5,631 rail cars less than we should have. And this year in the first quarter we are more than a thousand rail cars short.

Given such a situation, our work swings back and forth from a dead standstill to a feverish effort to catch up. I recall a time when our shift had just started work, and we were immediately ordered to slow the machines down and load the carbamide on trucks that would carry it to one of the free storage sites. The carbamide lingered there for a long time in paper sacks, beneath a canopy offering no shelter from rain and wind. Some of the carbamide got wet, and the sacks disintegrated. In the end, the quality of some of the carbamide fell below the state standard.

Whenever fertilizer cannot be delivered promptly, it is supposed to be stored in warehouses. But let's take a look at what happens there. In one of them, the largest, more than 40,000 tons of carbamide are dumped in a heap, even though the planned capacity of the warehouse is half less. Here, the fertilizer is piled in white mounds to the very ceiling, and somewhere up there a tractor crawls about leveling out these mountains. They managed to squeeze it in up there with a crane, after first dismantling the roof.

Now this warehouse is full to the brim with fertilizers. From here, the fertilizer is dispatched at a rate of a teaspoon per hour. Before you know it, a corner that was left empty is filled up in another 2 or 3 days. We were able to unload the warehouse somewhat by using our own resources--we began sending the products to some rayons of the Bashkir and Tatar ASSR in trucks. Sometimes we use so many trucks that the queue reaches a length of an entire kilometer. Fertilizer dispatched in this fashion for great distances comes out very expensive.

The mountains of highly valuable "field vitamins" become so compressed by their own weight that they transform into stony chunks which have to be broken up with pneumatic hammers or other available means. Such storage clearly worsens the quality of the fertilizer. In other warehouses, carbamide packed in sacks also hardens because the sacks reach a height of 20 meters. Even in this case the granules become monolithic. It is difficult to estimate how many additional concerns and outlays this means for the consumers.

The Kuybyshevsk railroad and its Bashkir department, which services us, is often reproached quite validly for the fact that few rail cars are allocated for fertilizer. We know that the railroaders do not have it easy. We should not only sympathize with them, but we should also help them. Our association found a way to create an entire repair section at the railroad shop, where broken-down, dilapidated rail cars are not only returned to a respectable appearance but are also dried out with the help of a powerful system installed there. But the anticipated good times never came about. Interruptions in rail car delivery had been the chief problem of production, and so it remains. For example we idled away 118 hours in March due to a shortage of rail cars, and even more in April.

We have every right to say to the railroaders that their cars often stand loaded longer than normal. And this is no time for excuses; they must simply improve labor organization and monitor the work of their machinery more strictly.

Another thing that should be kept in mind is that our plant is now working at an easy pace. The neighboring production operation, which furnishes us with the ammonium we need to produce carbamide, is undergoing reconstruction, and therefore we are experiencing interruptions in raw material deliveries. But even in this situation, much fertilizer is languishing in the warehouses. What will happen when our neighbors finish their reconstruction and the production of carbamide increases?

I think that the "Salavatnefteorgsintez" Association and the Kuybyshev railroad must get together to solve this pressing problem. Time does not wait, after all: It is now, in these springtime days, that our fertilizer is needed so much by rural laborers.

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CSO: 1841/229

## MINERAL FERTILIZER DELIVERIES FALL BEHIND

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 23 May 82 p 2

[Article by Ye. Leont'yeva: "Duty to the Field"]

[Text] A year and a half have passed since the new Ministry of Mineral Fertilizer Production was created. The very fact of its creation attests to the great significance attached to this sector, the goal of which is to raise the fertility of the fields, orchards and meadows and to increase the return from each hectare of soil. Today, during the spring field operations, at the time when the land is being seeded for the future crop, is the very time to see how successful the first steps of the new ministry were, and determine if it has become a dependable support to farming.

Fertilizers pass through the hands of "Soyuzsel'khozkhimiya" on their way to the countryside. It is a hard thing to speak with the deputy chairman of this association, A. Borisenko. He barely has enough time to answer the insistent intercity phone calls. The requests are all the same: "Help!" The replies are just as monotonous: "There aren't any reserves."

Perhaps little more need be said. A. Borisenko pushed a summary of the first quarter over to me across his desk. Out of 42 enterprises producing nitrogen fertilizers, 15 failed their delivery plans. This means 112,000 tons of product, enough to cause the kolkhozes and sovkhozes to sound the alarm. Out of 29 enterprises supplying phosphorus fertilizers, 9 failed to make it--they fell short by 22,000 tons. Out of nine potassium plants, six failed their delivery plan, meaning in turn that the grain farmers were short 188,000 tons of fertilizer.

The Rustavi Chemical Plant placed Azerbaijani and Georgian farm hands in a difficult position. The Tol'yatti Nitrogen Plant, the Berezniki Nitrogen Fertilizer Plant and the Novgorod "Azot" Association did little to help workers of the nonchernozem zone. On the whole the delivery plan for the first quarter was only 98.3 percent completed. And if we consider that last year's plan was only 94.1 percent completed, it becomes obvious that the debt is growing. And although the indicators improved in 4 months, it will still be difficult to catch up.

At the same time the sector does have enterprises that are successfully fulfilling and surpassing their pledges to the farmers. They include the Voskresensk "Minudobreniya" Association, the Almalyk and Gomel' chemical plants, the "Beloruskaliy" Association, the Novomoskovsk and Shchekino "Azot" associations and the Cherepovets

"Ammofos" Association. The Rovno "Azot" Association and the Uvarovo and Samarkand chemical plants, which were among the laggards for several years in succession, have started working much better this year. The sector's headquarters helped them with equipment, it sent teams of specialists to debug the production processes, and their leadership was fortified.

But as we can see, the successes of the leading collectives could not compensate for the overall shortfall. Explaining its causes, the chemists place the blame mainly on a shortage of rail cars. Yes, once again the railroaders are letting the fertilizer suppliers down. As an example hundreds of thousands of tons of fertilizers are idling undelivered in the "Uralkaliy" Association.

But the sector also has enough shortcomings of its own. They include frequent stoppages of large machine units owing to a low level of maintenance and violations of production discipline. As a rule the organization of repairs is weak, and their quality is low.

The shortage of fertilizers is aggravated by frequent violations of the state standards. Quality control specialists of "Soyuzsel'khokhimiya" note a decrease in the concentration of the main ingredient of the fertilizers, and higher moisture content and acidity, which cause caking of the fertilizers, transformation of the free-flowing product into monolithic chunks. Violation of the standards, the specialists feel, may raise the acid content of the soil, which is totally undesirable in relation to many crops.

Especially many complaints have been made in this regard about products from the Rustavi Chemical Plant. Several times "Soyuzsel'khokhimiya" asked the Ministry of Mineral Fertilizer Production to publish a directive halting the production and transportation of chemical products deviating from the standards. But unfortunately steps have not yet been taken. Poor quality fertilizers continue to reach the countryside.

The Sumgait superphosphate and Balakovo chemical plants are systematically violating the transportation rules. The fact that poor quality fertilizers are often shipped is bad enough, but to make matters worse, the rail cars travel underloaded. In Balakovo, for example, 120 out of 127 weighed rail cars were found to be underloaded.

It stands to reason that shipment discipline must be observed. But it is no less important to use what has already been produced with the greatest effectiveness. "Soyuzsel'khokhimiya" organs are especially remiss in this regard.

The problem is that the fertilizers far from always pay for themselves in high yields, and the predictions of the scientists, which are based on scientifically grounded fertilizing norms, are often proven untrue. Workers of the agrochemical service must ask themselves these questions today, now that the food program is being drawn up: Why does the effectiveness of fertilizers used with sugar beets, potatoes and other vegetables continue to be chronically low? Why are the yields of cereal crops growing so slowly in as economical a rayon as Severo-Zapadnyy for example, even though fertilizer use has been increased here by almost a factor of two?



According to data of the Scientific Research Institute of Fertilizers and Insecto-fungicides the most serious cause of low fertilizer effectiveness is the far from perfect level of agrochemical services to the countryside. At the moment the kol-khozes and sovkhoses have only 50 percent of the standard fertilizer warehouses they need. At 500 unloading stations in the Russian Federation fertilizer is dumped right at the sidings. The mechanization level of fertilizer application is low, and fertilizer mixing is poorly organized.

Incidentally, fertilizer mixing and optimum quantitative and qualitative selection of fertilizers for each farm have extremely important significance. At the moment this problem is being solved mainly by producing mixed fertilizers. But the nutrients required by a particular field do not remain constant; they change from year to year. The mixtures must be made locally, and "Soyuzsel'khozkhimiya" subdivisions are not prepared for this sort of work.

Scientists also note that the distribution of fertilizers, especially scarce phosphate fertilizers, between the republics, oblasts and rayons is other than optimum. Take at least Moscow Oblast. The total dosage of fertilizers introduced here in two five-year plans should have been more than enough to raise the status of all soil to optimum in terms of phosphorus content. But agrochemical surveys show that almost half of the farm land has not yet reached this level. It was found that fertilizers have been introduced at fields already containing a high phosphorus concentration.

Much still has to be done to create a stronger bond between science and practice and to improve the work of all units of the fertility industry. Their efficient, coordinated work is especially important today, in a time when the foundation for the future harvest is being laid.

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CSO: 1841/229



## GROWTH REGULATORS IN PLANT LIFE AND IN AGRICULTURE PRACTICE

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 1, Jan 82 pp 11-26

CHAYLAKHYAN, M. Kh., academician

[Abstract] The author reviews discoveries and applications of plant growth regulators including stimulators such as auxins, gibberellins, cytoquinines, inhibitors such as ethylene, abscisic acid, and their synthetic and their physiological analogs, as well as non-hormonal endogenous and exogenous substances (stimulators and inhibitors). Stressing the need for generally favorable growth factors, the author discusses auxins and their synthetic analogs, e.g., 2,4-dichlorophenoxyacetic acid as they affect tomatoes and other vegetables. Gibberellins, discovered in investigating rice plantation diseases in East Asia, have been found to have great impact on such crops as grapes, hemp and malt grains. Cytoquinines, originally discovered as a product of DNA breakdown by Americans F. Scoog and K. Miller, stimulate sprouting and shoot growth, and have been used in cloning microreproduction in the United States, the GDR, and in the USSR at the Academy of Sciences Central Botanical Garden and elsewhere. The inhibitors ethylene, abscisic acid and ethepall are used to hasten fruit ripening and blossoming, and to speed defoliation at the end of the growing season. The synthetic retardants CCC (chlorocholinechloride) and B-995 (N-dimethylaminosuccinic acid) and others have been used to limit winter wheat and rye beat-down and speed tomato ripening, while CCC and other retardants are used to prevent pre-harvest fruit drop and to preserve decorative blossoms. This review by Chaylakhyan address (at the Academy of Sciences) was followed by discussion, which stressed need for a sound agrotechnical basis prior to using these "wonder" substances, and for encouraging increased production of synthetic growth regulators.

[206-12131]

# PHYSICOCHEMICAL PROPERTIES OF LIQUID NITROGEN FERTILIZERS MADE FROM INDUSTRIAL WASTES

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 82  
(manuscript received 6 Nov 80) pp 59-61

UGAY, D. P., KHAMIDOV, Yu. A. and PRISEKINA, L. P., Chemical Institute,  
UzSSR Academy of Sciences

[Abstract] Liquid nitrogen fertilizers from industrial wastes contain 50-55% ammonium nitrate, 10-15% ammonium sulfate and small amounts of molybdenum and copper, with 22-24% nutrients. The authors studied the effects of adding carbamide on physicochemical properties such as density, viscosity and electrical conductivity. Tests were done in a 20-80° C temperature range. Results showed that when 30% carbamide was added, the activation energy was reduced to 3.4 kilocalories/mol. No chemical reaction between ammonium nitrate and carbamide was observed. Density of the liquid nitrogen fertilizers showed a straight line relationship with temperature in the 20-80°C range; electrical conductivity increased with increasing temperature in the same manner. Figure 1; references 4: 3 Russian, 1 Western. [208-12131]

UDC 661.715.5 : 546.39'185

# DEVELOPING PROCESS TO OBTAIN 'CARBOAMMOPHOSKA' BASED ON EXTRACTION PHOSPHORIC ACID FROM APATITE CONCENTRATE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 82 pp 212-214

BORISOV, V. M., BRODSKIY, A. A., MARKOVA, M. L., AZHIKINA, Yu. V.,  
GRISHAYEV, I. G. and KOZLOVA, Z. A.

[Abstract] Since previous research indicated that the physicochemical properties of carboammophos hygroscopic compounds were unsatisfactory, the authors designed a technological process to produce a non-caking fertilizer making use of phosphoric acid. The process required control of the pH of the pulp to avoid crystals of monoammonium phosphate with platelet or needle shapes; rather, with pH=6-7 and  $\text{NH}_3 : \text{H}_3\text{PO}_4 = 1.4-1.6$ , pyramid-shaped crystals that would not cake were produced. Other properties, such as solubility, viscosity, filterability and composition were also changed. The experimental results were subjected to field tests at the Scientific Institute for Fertilizers and Insectofungicides imeni Professor Ya. V. Samoylov. Details of the apparatus, and corrections to it to eliminate a Joule-Thomson choke effect, are described. Temperature control of the pulp to reduce corrosion was achieved with a two-phase process. The final product of this process had properties superior to carboammophoska produced by direct neutralization or the addition of ammonium sulphate. Figures 3; references 5: 3 Russian, 2 English. [218-12131]

## PILOT PLANT TESTING OF PROCESS FOR OBTAINING SLAG PHOSPHATES WITH MICROELEMENTS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 82 pp 214-217

GORAYEV, M. I. and SOPILIDI, V. N.

[Abstract] The production tests sought to determine the possibility of melting chunks of phosphate ore containing small amounts of copper, zinc and other metals into liquid slags without using sulfuric acid, in order to eliminate the thermal preparation stage in the current process while obtaining a fertilizer containing available  $P_2O_5$  and a number of microelements. Details of the grinding and melting process are diagrammed and explained. The process, at temperatures of 1300-1500° C, could be conducted without interruption, or, periodically. Slagging in the furnace required frequent cleanings. The process yielded a product with the desired microelements that did not dampen or compact readily, and that was assimilated under soil conditions. Metallic sublimates were a secondary product of the process, and the process was less costly than currently used methods for obtaining thermofertilizers. Figures 3.

[218-12131]

## INCREASING USE RELIABILITY OF INDUCTION FLOW METERS IN PRODUCING PHOSPHORUS-CONTAINING MINERAL FERTILIZERS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 82 pp 239-240

DOBROLYUBOV, V. V., PETROVSKAYA, V. A., SVISTUNOVA, T. V., PETROVSKIY, V. S., BIREV, Yu. N., GAMMERMAN, M. Ya., RUNOVA, Z. K., GRABYL'NIKOVA, V. I. and GRATSINSKAYA, V. A.

[Abstract] At present, flow meters with 10Kh18N10T steel electrodes that rapidly become pitted and require placement are used in producing the title fertilizers. The authors tested electrodes of 06KhN28MDT and 03KhN60MB alloys in 20-80% sulfuric acid solutions (with 10% increments) and a 93% variant at 60, 70, 80 and 90° C, in a 10% silicon hydrofluoric acid with various proportions of F :  $SiO_2$ , and in other acids at various temperatures. Results showed that the 03KhN60MB, or EP-758, alloy was corrosion-resistant at practically all temperatures and in all acids, while the other alloy could be used only selectively. EP-758 was also durable in extraction phosphoric acids made by dihydrate and semihydrate methods, with 10 times the useful life expected of electrodes made of a 12Kh18N10T alloy.

Figures 4.

[218-12131]

OPTIMIZING CHLOROPHOS PRODUCTION PROCESSES

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 82 pp 242-243

DENISOV, A. P., SAPOZHKOV, Yu. N., SHCHERBATYKH, Yu. I.,  
SHVETSOVA-SHILOVSKAYA, K. D., KLUBOV, A. Ya., LEVCHENKO, G. F. and  
MAKSIMOVA, V. A.

[Abstract] Chlorophos is prepared from chloral and dimethylphosphite. Among the 20% impurities in the technical chlorophos are found unreacted chloral and dimethylphosphite, as well as products of side reactions. The current multistage purification process involves neutralization and crystallization; the authors sought to find a more efficient production method using a two reactor method, with sequential loading chloral followed by dimethylphosphite while maintaining temperature. After aging the mixture was subjected to pressure from compressed nitrogen, volatile fractions released, and the final product evaluated. It contained 95-96% active ingredients with 1-1.3% acidity. The process was stated in a mathematical model to determine the directions of gradients to obtain maximum results. [218-12131]

UDC: 546.191:546.766

OXIDATION OF ARSINE BY CHROMIUM (VI) IN PRESENCE OF IODIDE IONS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 55, No 4, Apr 82  
(manuscript received 21 Mar 80) pp 761-765

DORFMAN, Ya. A., POLIMBETOVA, G. S., MANSUROV, B. A. and  
BIKMUKHAMEDTOVA, A. K.

[Abstract] One method of purification of exhaust gases to remove arsenic is its oxidation with compounds of Cr (VI). This article studies the reaction of oxidation of arsine by chromium (VI) in the presence of proton ligand catalysts. Studies were performed on a gas flow installation in a 0 gradient isothermal reactor with arsine produced by reducing an  $\text{As}_2\text{O}_3$  solution with metallic zinc in an acid medium. The arsine was then diluted with argon to  $10^{-2}$ - $10^{-3}$  vol.%. Oxidation was performed in a  $\text{K}_2\text{Cr}_2\text{O}_7$ - $\text{HClO}_4$ - $\text{KI}$ - $\text{H}_2\text{O}$  solution. The influence of concentration of all system components and of temperature on reaction kinetics was studied. The reaction rate was found to be a complex function of the concentration of the components and temperature. The reaction follows the stoichiometric equation  $4\text{Cr}_2\text{O}_7^{2-} + 3\text{AsH}_3 + 32\text{H}^+ \rightarrow 8\text{Cr}^{3+} + 3\text{H}_3\text{AsO}_4 + 16\text{H}_2\text{O}$ . The influence of proton acidity was studied at 25 and 40°C. Increasing hydrogen ion content increases the reaction rate of the process. Introduction of iodide ions results in an increase in initial reaction rates without significantly changing the form of the kinetic curves. The iodide ion reaction order is close to 1. Increasing the temperature from 20 to 50°C has a positive influence on reaction rate. A mechanism for the process of oxidation of  $\text{AsH}_3$  by chromium (VI) in the presence of iodide ions is suggested. Figures 3; references 10: 7 Russian, 3 Western.  
[232-6508]

## ION EXCHANGE PHENOMENA

UDC: 543.247.1:546.791.2

ION-SELECTIVE URANYL ELECTRODE WITH MEMBRANE BASED ON A MIXTURE OF URANYL DI-2-ETHYLHEXYLPHOSPHATE WITH TRIBUTYLPHOSPHATE IN BENZENE

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 37, No 4, Apr 82  
(manuscript received 5 Jan 81) pp 645-649

SEREBRENNIKOVA, N. V., KUKUSHKINA, I. I. and PLOTNIKOVA, N. V.,  
Kemerovo State University

[Abstract] A study is presented of the electrochemical properties of an uranyl electrode with a liquid membrane, a benzene solution of  $\text{UO}_2\text{R}_2$  mixed with tributylphosphate (TBP). The electrochemical properties of the electrode were studied using a TR-1501 electrometer with EZ-7 strip-chart recorder to record the transmembrane potential difference as a function of uranyl ion activity in aqueous sulfate solutions. The selectivity coefficients were determined by the method of bionic potentials for the electrode with various concentrations of uranyl di-2-ethylhexylphosphate and with various additives of TBP. As the  $\text{UO}_2\text{R}_2$  concentration is changed the selective properties change with respect to a number of singly and doubly charged ions. The uranyl membrane electrode is more highly selective in the presence of a number of ions and has a lower boundary of uranyl ion content determination than electrodes with the membrane containing only uranyl di-2-ethylhexylphosphate in benzene. The properties of the electrode depend both on the concentration of ion exchange substance and on the quantity of tributylphosphate added. Figures 3; references 7: 5 Russian, 2 Western.  
[230-6508]

## ORGANOMETALLIC COMPOUNDS

UDC 547.55

### N,N'-DIACYLDIIMIDES OF SELENIUM, PART 3: NEW METHODS OF SYNTHESIS

Leningrad ZHURNAL OGRANICHESKOY KHIMII in Russian Vol 18, No 5, May 82  
(manuscript received 30 Jun 81) pp 964-967

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[Abstract] Conditions are described under which the reaction of selenyl fluoride or chloride with N,N-bis(trimethylsilyl)amides (I) in a 1:2 molar ratio led to the formation of selenium N,N'-diaacyldiimides  $((\text{RSO}_2\text{N}=\text{Se})_2\text{Se})$ . The reaction of I with selenyl fluoride proceeds in ether or dichloroethane at 20°C to completion in 15-20 min; the reaction with selenyl chloride is somewhat slower. Selenium diimides were also obtained by the reaction of iminoselenyl fluorides  $(\text{RSO}_2\text{N}=\text{SeF}_2)$  with hexamethyldisiloxane; however, the latter did not react with selenyl chloride or iminoselenyl chlorides. Iminoselenyl fluorides were prepared by equimolar reaction of  $\text{SeF}_4$  with I. The N-phenyl- and N-methylsulfonyliminoselenyl fluorides are colorless crystals soluble in dichloroethane, benzene, and methylene chloride, show low solubility in  $\text{CCl}_4$  and ether, and are hydrolyzed by moisture in air. References 10: 6 Russian, 4 Western.  
[252-12172]

UDC: 541.59:546.881

### INTERACTION OF VANADIUM (V) WITH CERTAIN PHOSPHORUS-CONTAINING COMPLEXONS

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 27, No 4, Apr 82  
(manuscript received 19 Aug 81) pp 833-838

SPITSYN, V. I., PECHUROVA, N. I., STUKLOVA, M. S. and NERENDOOGIYN, N., Moscow State University imeni M. V. Lomonosov

[Abstract] A study is made of the interaction of vanadium (V) with phosphorylated analogs of such widely used complexons as nitrilotriacetic,

ethylenediamine tetraacetic and diethylene triamine pentaacetic acids. The reactions were studied kinetically and spectrophotometrically using twice recrystallized  $\text{NaVO}_3$  and the complexons. The concentration of complexons was established by measuring the pH. Oxidimetric titration was used to determine the  $\text{NaVO}_3$  concentration. It is found that the processes of complex formation generally followed the equation  $\text{VO}_2^+ + \text{H}_n\text{K}_n\text{VO}_2\text{H}_{n-4}\text{K}^3 + 4\text{H}^+$ , where  $n=5, 6, 8$  or  $10$ . Oxidation-reduction interactions in these systems are also studied. The rate of intracomplex redox processes increases in the sequence NTP-ADPA-EDTP-DTPP. This is explained basically by the equivalent increase in reducing capacity of the complexes. Figures 4; references 9: 8 Russian, 1 Western.  
[204-6508]

UDC: 542.06+546.713'185

#### INTERACTION OF MANGANESE DIOXIDE WITH PHOSPHORIC ACID

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 27, No 4, Apr 82  
(manuscript received 2 Mar 81) pp 943-948

TETEREVKOV, A. I. and CHUBAROV, A. V., Belorussian Institute of Technology  
imeni S. M. Kirov

[Abstract] Phosphates of manganese (III) can be obtained by interacting phosphoric acid with potassium permanganate or manganese carbonate with phosphoric acid. The interaction of manganese dioxide with ammonium dihydrophosphate produces mixed ammonium pyrophosphate and manganese (III). However, the interaction of manganese dioxide with phosphoric acid has not been sufficiently studied. The initial substances used in this study were manganese dioxide and phosphoric acid. They were carefully ground and mixed, then placed in crucibles and heated in a muffle furnace. The influence of temperature on completeness of interaction was determined by thermovolumetric measurements in which the reaction mixture was placed in a sealed reactor, heated by an electric furnace at  $5-8^\circ\text{C}/\text{min}$ , the water vapor liberated was absorbed by sulfuric acid and the volume of oxygen was measured by a gas burette. The quantity of oxygen liberated is proportional to the degree of interaction. The manganese (III) pyrophosphate produced by interacting manganese (III) orthophosphate at  $300-450^\circ\text{C}$  with phosphoric acid is stable up to  $600^\circ\text{C}$ , above which temperature it decomposes, liberating oxygen. Figures 3; references 7: 4 Russian, 3 Western.  
[204-6508]



## COMPLEX COMPOUNDS OF METALS WITH ENANTHIC ACID HYDRAZIDE

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 27, No 4, Apr 82  
(manuscript received 12 May 81) pp 972-974

MACHKHOSHVILI, R. I., MITAISHVILI, G. Sh. and PIRTSKHALAVA, N. I.,  
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USSR Academy of Sciences; Tbilisi State University

[Abstract] Continuing the studies of complex metal compounds with carboxylic acid hydrazides, the authors attempted to synthesize metal complexes containing enanthic acid hydrazide in the internal molecular sphere. This work briefly describes the synthesis and some results of investigation of the compounds obtained. The compounds produced were:  $\text{Mn(HE)}_3\text{Cl}_2 \cdot 0.5\text{H}_2\text{O}$ ;  $\text{Mn(HE)}_3\text{SO}_4 \cdot \text{H}_2\text{O}$ ;  $\text{Fe(HE)}_3\text{SO}_4 \cdot 1.5\text{H}_2\text{O}$ ;  $\text{Co(HE)}_3\text{SO}_4 \cdot 2\text{H}_2\text{O}$ ;  $\text{Ni(HE)}_3\text{Cl}_2 \cdot 3\text{H}_2\text{O}$ ;  $\text{Ni(HE)}_3\text{SO}_4 \cdot 2\text{H}_2\text{O}$ ;  $\text{Cu(HE)}_2\text{Cl}_2 \cdot \text{H}_2\text{O}$ ;  $\text{Cu(HE)}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$ ;  $\text{Cd(HE)}_3\text{Cl}_2 \cdot \text{H}_2\text{O}$  and  $\text{Cd(HE)}_3\text{SO}_4$ . Based on the spectral data and composition of the compounds with Mn, Fe, Co, Ni and Cd, they probably have octahedral structure. In the copper sulfate compound the spectral data indicate that the sulfate radical is in direct contact with the copper atoms and restructures the coordination polyhedron of the metal. References 5 (Russian). [204-6508]

MIXED PYROPHOSPHATE  $\text{KVOP}_2\text{O}_7$ 

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 27, No 4, Apr 82  
(manuscript received 6 Apr 81) pp 1072-1073

TETEREVKOV, A. I. and POLOYKO, V. I., Belorussian Institute of Technology  
imeni S. M. Kirov

[Abstract] Potassium-vanadium pyrophosphate  $\text{KVOP}_2\text{O}_7 \cdot 0.2\text{H}_2\text{O}$  was obtained by heating a mixture of potassium dihydroorthophosphate, vanadium pentoxide and phosphoric acid in a ratio of 2:1:2 at 350°C for 5 hours. Paper chromatography showed that the product contains only traces of orthophosphate. IR and x-ray phase analyses were performed. The chemical properties of  $\text{KVOP}_2\text{O}_7$  differ significantly from  $(\text{VO})_2\text{P}_2\text{O}_7$ , which oxidizes rapidly at over 400°C to  $\text{VOPO}_4$  and melts at 760°C. The new compound is less stable than vanadium orthophosphate  $\text{VOPO}_4$ , which disproportionates with splitting of oxygen and forms a mixture of vanadyl and vanadane phosphates at over 760°C. Figure 1; references 2 (Russian). [204-6508]

## ORGANOPHOSPHORUS COMPOUNDS

UDC 547.963.32:(547.26:678.686)

### REACTION PRODUCTS OF ADENOSINE-5'-MONOPHOSPHATE AND 1-HYDROXY-2,3-EPOXYPROPANE

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 18, No 5, May 82  
(manuscript received 6 Jul 81) pp 987-991

KORSHAK, V. V., SHTIL'MAN, M. I., TARASOV, V. N., ROGOZHIN, S. V. and  
VARLAMOV, V. P., Institute of Chemical Engineering imeni D. I. Mendeleyev,  
Moscow

[Abstract] Studies were conducted on the reaction of adenosine-5'-monophosphate (an active nucleophilic agent leading to the opening of the epoxide ring) with 1-hydroxy-2,3-epoxypropane in dimethylformamide at 20-55°C in sealed ampules filled with argon. The products were separated by TLC and were identified by chemical analysis and evaluation of IR and UV spectra as P-(2,3-dihydroxypropyl)adenosine-5'-monophosphate(I), P-(2,3-dihydroxypropyl)-N<sup>1</sup>-(2,3-dihydroxypropyl)adenosine-5'-monophosphate (II), and N<sup>1</sup>-(2,3-dihydroxypropyl)adenosine-5'-monophosphate(III). At 55°C, as opposed to lower temperatures, the yields of I and II increased, while that of III decreased. References 9: 3 Russian, 6 Western.  
[252-12172]

UDC 547.915+547.953

### NEW SOLUTIONS IN SYNTHESIS OF GLYCEROPHOSPHATIDES

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 18, No 5, May 82  
(manuscript received 26 Mar 81) pp 1115-1116

PREDVODITELEV, D. A., RASADKINA, Ye. N., GRACHEV, M. K. and  
NIFANT'YEV, E. Ye., Moscow State Pedagogical Institute imeni V. I. Lenin

[Abstract] Glycerophosphoalkylation was employed for the preparation of optically-active glycerothiophosphatides. Conditions are described for the synthesis of 1,2-dipalmitoyl-sn-glycero-3-thiophosphorylcholine,

O-(N-methyl-N-benzylaminoethyl)-O-benzyl-diethylamidophosphite, O-(1,2-distearoyl-rac-glycero-3)-O-(N-methyl-N-benzylaminoethyl)-O-benzylphosphite, 1,2-distearoyl-rac-glycero-3-phosphoryl-O-benzyl-O-(N-methyl-N-benzylaminoethanol), and 1,2-distearoyl-rac-glycero-3-phosphoryl-N-methylaminoethanol. References 3: 2 Russian, 1 Western.  
[252-12172]

UDC 577.153

SYNTHESIS AND ANTI-CHOLINESTERASE ACTIVITIES OF O,O-DIISOPROPYLTHIOPHOSPHORIC ACID ESTERS BASED ON NITROGEN-CONTAINING HETEROCYCLES

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 82  
(manuscript received 9 Dec 80) pp 31-35

KARIMOV, D. T., DALIMOV, D. N. and ABDUVAKHABOV, A. A., Institute of Bioorganic Chemistry, UzSSR Academy of Sciences

[Abstract] As little detailed information exists on the dependence of selective action on the structure of the alcohyl part of the butylcholinesterase inhibitor molecule in its reactions with the title compound, the authors synthesized several O,O-diisopropylthiophosphates and their methiodides and studied their anticholinesterase activity relative to human erythrocyte acetylcholinesterase and horse blood serum butyrylcholinesterase. Details of the chemical procedures and results are given. All the compositions studied were irreversible cholinesterase inhibitors, but derivatives of morpholine and beta-pipecoline had a weaker inhibiting action, the first because of its hydrophilic grouping, the second because sorption was hampered on the anion portion of acetylcholinesterase. With butyrylcholinesterase, all the compounds were strong selective irreversible inhibitors. The results indicate essential differences in the structure of the hydrophobic framework of anion portions of the two cholinesterases. References 7: 4 Russian, 3 Western.  
[208-12131]

UDC 547.26'118

TRIMETHYLSILYL GROUP MIGRATION IN IMIDOPHOSPHORIC COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 23 Apr 81) pp 760-763

TIKHONINA, N. A., GILYAROV, V. A. and KABACHNIK, M. I., Institute of Hetero-Organic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences

[Abstract] The  $\text{SiMe}_3$  group readily migrates (West, 1977). Migration of the  $\text{SiMe}_3$  group has been observed from the nitrogen to the carbon atom

(irreversible), between 2 nitrogen atoms in the N = P-N triad (reversible), and between two oxygen atoms in the pentad O - P = N - P = O (reversible and irreversible). The present article examines reactions of diethylamido-phosphate and dibutylamidophosphate with trimethylchlorosilane in the presence of triethylamine. They obtained products like those of Meyer (Tetrahedron Letters, 1969). Infrared, nuclear and proton magnetic resonance spectra were used to confirm the structures of the imidophosphates produced. The SiMe<sub>3</sub> groups attached to various atoms in the molecules, regardless of conformational transitions related to temperature increase. Imidophosphate constants from diethylchlorophosphates and from diethylamidophosphates coincided. An analogous SiMe<sub>3</sub> migration was observed in the reaction of O,O-diethyl-N,N-bis(trimethylsilyl)amidophosphite with diethylazidophosphite. The authors suggest that an imidophosphate first forms in which the SiMe<sub>3</sub> group migrates from the amide to the imide nitrogen atom, or to the phosphoryl oxygen atom. Details are presented in an experimental section. References 15: 8 Russian, 7 English. [222-12131]

UDC 547.241 + 547.26'118

#### REACTION OF ALKYLDIHALOGENPHOSPHINES WITH DERIVATIVES OF TRIVALENT PHOSPHORUS ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 20 Apr 81) pp 763-768

KABACHNIK, M. M. NOVIKOVA, Z. S. and LUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] In earlier studies the authors had shown that acid chlorides of trivalent phosphorus acids are highly reactive in nucleophil substitutions, compared to acid bromide and chloride. In the present work the authors studied the reaction of alkyl diiodophosphines and phosphorus triiodide with esters of trivalent phosphorus acids. Analogous to monoiodoanhydrides, diiodoanhydrides readily underwent an Arbuzov reaction, but at very low temperatures (below -60° C) the reaction of tert-butyl-diiodophosphine with the isopropyl ester of tert-butylphosphonic acid brought formation of diphosphoro-(V)-substituted phosphines that could be isolated by distillation. Most of the latter were thermally stable compounds that readily distilled in a vacuum. Since the reaction of monohalogen-anhydrides of phosphorus acids with their esters initially took place on the phosphorus atom, the authors suggest that kinetically controlled products resulted. Use of the general formula (RO)<sub>2</sub>PXP(OR)<sub>2</sub>, X=CH<sub>2</sub> made it possible to synthesize a new type of heteroorganic phosphorus compounds, triphosphacyclobutanes. For simplicity, the authors successfully duplicated the results by the reaction of alkyl diiodophosphines with sodium salts of trivalent phosphorus acids in ether at 0° C. Further variations are also outlined. Chemical details are presented in the experimental section. References 9: 6 Russian, 3 English. [222-12131]

REACTION OF MIXED ESTERS OF PHOSPHORUS(III) ACIDS, CONTAINING  
SIMULTANEOUSLY ALKOXYL AND TRIORGANOSILOXYL GROUPS AT THE PHOSPHORUS  
ATOM, WITH HALOGENS, ALKYL HALIDES AND ACYLS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 21 Jan 81) pp 769-776

GAZIZOV, T. Kh., SUDAREV, Yu. I., SHAKIROV, I. Kh., SMIRNOV, V. N. and  
PUDOVNIK, A. N., Institute of Organic and Physical Chemistry  
imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Phosphorus (III) acid esters such as  $(R_3SiO)_n P(OR')_{3-n}$  react with alkyl halides and acyls to form corresponding alkyl- and acyl phosphonates. The authors studied such reactions in mild conditions, and learned that dimethyltrimethylsilylphosphites react with chloromethyl esters at 50° C to form 72% dimethylmethoxymethyl phosphonate and 74% trimethylchlorosilane. Diethyldimethylsilylphosphite reacts with benzyl chloride at 80-100° C and 50 mm of mercury pressure to produce 41% trimethylchlorosilane and, after distillation, 50% diethylbenzylphosphonate. In the second stage of reaction with Cl or Br halogens, an electrophil trimethylsilyl group detaches. The authors also found that, when heated in a benzene solution, a tetroxide of (trimethylsiloxy)phosphonium iodide breaks down into tri(trimethylsilyl)phosphate and trimethyliodosilane. The compounds' structures were confirmed by nuclear magnetic resonance of  $^{31}P$ . Introduction of a phosphorus atom of the electron-donor phosphoryl compound made the phosphoryl group more reactive to trimethylhalosilanes. Data obtained confirm the authors' hypothesis that the reaction of mixed esters of phosphorus(III) acids with the title compounds takes place in a stage of competitive separation of unequal radicals with selective desilylation. Chemical details are given in the experimental section. Figures 2; references 22: 17 Russian, 5 English.  
[222-12131]

UDC 547.26'118 + 547.442.2

REACTION OF PHOSPHOROUS ACID ESTERS WITH ACID CHLORIDES AND FLUORIDES OF  
CARBOXYLIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 18 Mar 81) pp 776-780

GAZIZOV, T. Kh., BELYALOV, R. U. and PUDOVNIK, A. N., Institute of  
Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch,  
USSR Academy of Sciences

[Abstract] Triphenylphosphite reacts with halogenanhydrides of carboxylic acids forming diphenylhalogen phosphite and the phenyl ester of the

corresponding carboxylic acid. To explain the mechanism of such reactions, the authors conducted the title reactions. Their studies indicated that diethylethylphosphonite and triethylphosphite reacted with acetyl chloride in an ether solution at temperature intervals of -113 to 0 and -70 to + 69°C, respectively, with two exothermal effects that indicate a two-stage reaction. Diethylchlorophosphite did not, however, react with ethylacetate even at 100° C for 1 hour. The experimental data confirm that the reaction of trialkylphosphites with acid chlorides of carboxylic acids follow an Arubzov regrouping schema. Triethyl-, diethyl-, phenyl- and diethyl-beta-beta-beta-trichloroethylphosphites react with benzoyl fluoride at 100-130°C in 1 hour to produce diethylfluorophosphite and corresponding benzoic acid esters. In reactions of trialkylphosphites with acid chlorides of carboxylic acids the balance is shifted toward phosphonium chloride, which readily dealkylates to form a suitable acylphosphonate. The authors explain these reactions by a mechanism whereby they pass through an initial reaction of the phosphorus atom of a phosphorous acid ester with carbonyl carbon of benzoyl fluoride. Figure 1; references 19: 16 Russian, 6 Western. [222-12131]

UDC 542.91 + 547.1'118

# REACTION OF 2-SUBSTITUTED 1,3,2-OXAZAPHOSPHOLANES WITH ETHYL ALCOHOL AND PHENOL

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 4 Jun 81) pp 781-786

PUDOVIK, M. A., KIBARDINA, L. K. and PUDOVIK, A. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arubzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] The authors studied alcoholysis and phenolysis of several little-studied 2-substituted 1,3,2-oxazaphospholanes to determine the effects of such factors as the nature of substitutes at phosphorus, nitrogen and carbon atoms of the ring, the character of the proton-donor reagent, and acidic and basic catalysis. Since secondary processes related to functionally-substituted phosphites and phosphonites complicate such transformations, the reactions were monitored through NMR of <sup>31</sup>P spectroscopy. They found that the reaction capability of oxazaphospholanes depends strongly on the nature of the substitute at the endocyclic nitrogen atom. Data indicate that, in all studied reactions, phenolysis of 2-alkoxy(alkyl)-1,3,2-oxazaphospholanes takes place much more rapidly than alcoholysis. In studying the effects of acidic and basic catalysis, they learned that in the presence of catalytic quantities of metallic sodium or sodium ethylates, base additions did not have a catalytic effect on alcoholysis of the endocyclic P-N bond. The catalytic action of CH<sub>3</sub>COOH during alcoholysis of 1,3,2-oxazaphospholanes was tied to the formation of intermediate reacting acylphosphonites or phosphites, resulting from breaking the endocyclic

P-N bond. A nucleophil substitution reaction at the trivalent phosphorus atom was involved. Chemical details are given in the experimental section. Results indicate much faster reaction with acid and basic catalysts present. References 11: 10 Russian, 1 English.  
[222-12131]

UDC 547.241

#### REACTION OF 2-ETHYL-2,5-DIOXO-1,2-OXAZOPHOSPHOLANE WITH ALCOHOLS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 28 Jul 81) pp 786-789

PUDOVIK, A. N., VASYANINA, M. A., POKROVSKAYA, I. K. and KHAYRULLIN, V. K.,  
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Branch, USSR Academy of Sciences

[Abstract] Earlier the authors had shown that the reaction of ethyl or propyl alcohol with the title compound involved an attack of the alcohol on the phosphorus atom and the formation of an ethyl or propyl ester of ethyl(beta-carboxyethyl)phosphonic acid. In the present study they found that ambident phospholanes react with alcohol in two directions, which depend on temperature, the order of adding reagents, and even the number of carbon atoms in the alcohol molecules. Phospholane reacts with propyl alcohol in a single direction, independent of the order of adding reagents, forming a propyl ester of ethyl(beta-carboxyethyl)phosphonic acid, whose isomer can be produced by cooling the reactive mixture. Chemical details are given in the experimental section. References 3 (Russian).  
[222-12131]

UDC 547.26'118

#### FEATURES OF THERMAL STABILITY OF 4,4-DIMETHYL-2-ETOXY-2-OXO-1,3,2-DIOXAPHOSPHOLANE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 22 Jul 81) pp 795-796

NIFANT'YEV, E. Ye. and KRYUCHKOV, A. A., Moscow State Pedagogical Institute imeni V. I. Lenin

[Abstract] The authors studied thermal stability of the title compound in comparison to diethyl-tert-butylphosphates by thermogravimetric analysis and infrared spectroscopy. They found that thermal destruction of phosphate of the latter compound began at 60-70°C, while the cyclical phosphate in the first required temperatures of 140°C and above to bring destruction. They

hypothesize that the phosphate structure prevents conformations and electron redistributions in the molecule that would be found in thermal dealkylation of tert-butyl esters. Chemical details are given in the experimental section. Figures 1; references 1 (English).  
[222-12131]

UDC 547.557 + 546.183 + 541.127

PHOSPHORYLATED ADAMANTANES, PART 4: KINETICS OF IMINATION OF 1- AND 2-ADAMANTYL ESTERS OF TRIVALENT PHOSPHORUS ACIDS BY PHENYLAZIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 29 May 81) pp 797-801

KASUKHIN, L. F., PONOMARCHUK, M. P., YURCHENKO, R. I., KLEPA, T. I., YURCHENKO, A. G. and GOLOLOBOV, Yu. G., Institute of Organic Chemistry, UkSSR Academy of Sciences; Kiev Polytechnical Institute

[Abstract] Earlier studies of chemical transformations of adamantylphosphites showed that they enter reactions that are typical for trivalent phosphorus. For a proper quantitative comparison of electronic and steric parameters of their radicals, the authors studied kinetics of imination of a number of 1- and 2-adamantyl esters of phosphorous and phenylphosphonic acid, using a nitrogen metering method for control. Results showed that exchanging small MeO and EtO radicals with large 1- and 2-AdO groups had little impact. Analogous comparisons at the second stage showed that one 1-AdO radical at the tetracoordinated phosphorus atom slowed the reaction by a factor of 3-4, while two such groups slowed it by 150-220 times. Unexpectedly, exchanging a methoxyl or ethoxyl radical for a 2-AdO group did not reduce the reaction speed or change the activational characteristics. During distillation, the liquid imides produced apparently underwent imide-amide regrouping accompanied by a reduction in ethoxyl group content in the distilled products. Chemical details are given in the experimental section. References 9: 8 Russian, 1 English.  
[222-12131]



## REACTION CAPABILITY OF HYPOPHOSPHITES, PART 4: REACTION OF ALKYLHYPOPHOSPHITES WITH ALPHA-BROMOCINNAMIC ALDEHYDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 17 Jun 81) pp 801-808

YUDELEVICH, V. I., SOLONKINA, I. V., SOKOLOV, L. B., IONIN, B. I., KOMAROV, Ye. V., LIFSHITS, M. I. and KARPENKO, M. P., All-Union Scientific Research Technological Institute for Medical-Purpose Antibiotics and Enzymes; Leningrad Technological Institute imeni Lensovet

[Abstract] The authors prepared alkylhypophosphites, and without separating them from its synthesis mixture, reacted them with the title aldehyde, thus making it possible to obtain new synthetic analogs of organic phosphorus antibiotics. Various related substances were produced and their structures confirmed by proton magnetic resonance and infrared spectroscopy. They include white crystalline alkylphosphinates, a colorless transparent acylated ethyl ester of phosphonic acid, an oxaphospholene, an acetylene phosphinate, and other products. Biological tests showed that the synthesized final alkylphosphinates and their derivatives have low antifungicidal and moderate antibacterial activity both for Gram-positive and Gram-negative bacteria. Chemical details are given in the experimental section. Figures 4; references 13: 12 Russian, 1 English.  
[222-12131]

## REACTION CAPABILITY OF HYPOPHOSPHITES, PART 5: REACTION OF ETHYLHYPOPHOSPHITE WITH p-AMINOACETOPHENONE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 17 Jun 81) pp 809-810

YUDELEVICH, V. I., FETTER, A. P., KOMAROV, Ye. V. and IONIN, B. I., All-Union Scientific Research Technological Institute for Medical-Purpose Antibiotics and Enzymes; Leningrad Technological Institute imeni Lensovet

[Abstract] Studying the title reaction, the authors determined that independent of proportions of ethylhypophosphate and p-aminoacetophenone, both 1-hydroxyphosphonite and the product of dehydration, the ethyl ester of 1-(4-aminophenyl)ethene phosphonic acid, formed when the reaction was conducted in ethyl alcohol at 70-78° C. Separation of final products was hampered by use of other solvents, such as pyridine and dioxane, but analogous results were confirmed by thin-layer chromatography. Infrared and proton magnetic resonance spectroscopy were employed to confirm structures of the compounds obtained. Chemical details are given in the experimental section. References 6: 3 Russian, 3 English.  
[222-12131]

## SYNTHESIS AND TRANSFORMATIONS OF DICHLOROANHYDRIDES OF 1-METHOXY-2,3-ALKADIENE-2-PHOSPHONIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 10 Jul 81) pp 816-825

BREL', V. K., IONIN, B. I. and PETROV, A. A., Leningrad Technological  
Institute imeni Lensovet

[Abstract] The authors show that the title dichloroanhydrides are suitable initial compounds for the synthesis of 1,3-alkadienephosphonic derivatives, and can also be used to obtain esters, phosphine oxides and other allenes containing phosphorus. Their tendency to acetylene-allene isomerization depends strongly on the nature of the acetylene alcohol used. The structures of the compounds produced were confirmed by infrared, proton magnetic resonance and  $^{31}\text{P}$  nuclear magnetic resonance spectroscopy. They are more suitable than direct synthesis for producing oxides of dialkyl(1-methoxy-2,3-alkadiene-2-yl)phosphines. The authors found that their dichloroanhydrides react exclusively with methyldichlorosilane to produce dichloroanhydrides of 3-chloro-1,3-alkadiene-2-phosphonic acids, with no hydrogen chloride produced. The latter's structures were confirmed by infrared, PMR and NMR of  $^1\text{H}$ ,  $^{31}\text{P}$  and  $^{13}\text{C}$ . The title dichloroanhydrides also produced 1,3-alkadienes with a phosphorus atom at the first carbon atom of the 1,3-butadiene system. Chemical details are given in the experimental section. Figures 4; references 17: 14 Russian, 3 English.  
[222-12131]

UDC 542.91 : 547.1'118

## PHOSPHORYLATION AND ALKYLATION OF DIISOPROPYLTHIOPHOSPHORIC ACID BY COMPLETE MONOAMIDOPHOSPHITES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 22 May 81) pp 825-830

YELISEYENKOV, V. N. and SHUMILINA, T. N., Institute of Organic and Physical  
Chemistry imeni A. Ye. Arbuzov, USSR Academy of Sciences

[Abstract] Continuing their earlier studies of phosphorylation, the authors studied reactions of O,O-diisopropylthiophosphoric acid with various dialkyl(diethylamido) phosphites, which yielded mixed anhydrides of O,O-diisopropylthiophosphoric and dialkylphosphorous acids. The composition and structure of these products were confirmed by elemental analysis, NMR of  $^{31}\text{P}$  and certain chemical transformations. The mixed anhydrides were thermally stable at temperatures of  $100^\circ\text{C}$  and above. Temperature variation in the reactive mixture affected the exact product of the given reaction.

The results indicate the presence of two cation forms, one with a proton bond to the nitrogen atom and another, to the phosphorus atom; the latter bonding did not take place at temperatures below 100° C, but only at 150-170°. Chemical details are given in the experimental section. Figure 1; references 10: 7 Russian, 3 Western.  
[222-12131]

UDC 547.558.1

#### SYNTHESIS AND STUDY OF TETRAARYLPHOSPHONIUM SALTS CONTAINING FORMYL

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 9 Feb 81) pp 830-838

SHEVCHUK, M. I. and BUKACHUK, O. M., Chernovtsy State University

[Abstract] Continuing earlier studies, the authors sought possible ways to synthesize phosphonium salts based on the reaction of triphenylphosphine with p-bromobenzaldehyde, 5-bromo-2-formylthiophenyl and 5-bromo-2-formylfuran. The reactions took place only in sealed ampules with a double quantity of triphenylphosphine. The reaction took place under more moderate conditions with 5-bromo-2-formylfuran, apparently because of a more mobile halogen atom in 5-bromo-furfural. With a triple surplus of potassium permanganate in oxidizing the product 2-formylthienyl-5-(triphenylphosphonium) bromide, a triphenylphosphonium group separated as a triphenylphosphine oxide, along with the usual aldehyde group oxidation to the carboxyl group. Other products of the reactions include phosphonium hydrazones, arylenium hydrazones, azomethynes, and phosphonium styryls. Ultraviolet and infrared spectroscopy were used to confirm the structures of the products obtained. Chemical details are given in the experimental section. References 2: 1 Russian, 1 Italian.  
[222-12131]

UDC 547.341

#### STUDY OF DERIVATIVES OF PHOSPHONIC AND PHOSPHONOUS ACIDS, PART 108: INFRARED SPECTROSCOPY STUDY OF E,Z-ISOMERIZATION OF PHOSPHORYLATED ENAMINES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 9 Jun 81) pp 838-843

ALIKIN, A. Yu., SOKOLOV, M. P., LIORBER, B. G., YARKOVA, E. G., RAZUMOV, A. I. and ALPAROVA, M. V., Kazan' Chemical and Technological Institute  
imeni S. M. Kirov

[Abstract] Continuing work on the fine structure of secondary phosphorylated enamines, the authors studied E- and Z-isomerization in heavily diluted

solutions to determine the connection between spectral characteristics of infrared spectra and structural features of the molecules. Solutions of 0.5-0.005 mol/l in carbon tetrachloride, chloroform and acetonitril with the indicated substances showed Z- and E-forms with intramolecular and intermolecular hydrogen bonds, respectively. They also studied 2-methyl-3-diisopropoxyphosphonyl-6-methoxy-1,4,5,6-tetrahydropyridine as a fixed model of secondary phosphorylated ketone enamine where no Z- form could exist. The infrared spectroscopic data obtained, and NMR information, confirmed the existence of mixed E- and Z-forms of secondary phosphorylated ketone enamines. Deformational variations of the NH bond and valent variations of the ethylene and NH bonds were observed in both E- and Z-isomers.

References 4 (Russian).

[222-12131]

UDC 547.241

#### REACTION OF O,O-DIETHYL-alpha-METHYLAMINO BENZYL PHOSPHONATE WITH CARBON DISULFIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 25 May 81) pp 843-847

PROKOF'YEVA, A. F., ALESHNIKOVA, T. V., NEGREBETSKIY, V. V., MEL'NIKOV, N. N. and KOROLEVA, T. I., All-Union Scientific Research Institute for Chemical Means of Plant Protection

[Abstract] Since there are relatively few data on the behavior of carbanions formed from dialkylaminoalkylphosphonates in reactions with electrophil reagents, the authors studied the title reaction, which produced a carbanion that in turn decomposed into a benzalmethylamine and sodium diethylphosphite. The structures of the compounds obtained were confirmed by NMR of  $^{31}\text{P}$ . Addition of methyl iodide to the reactive mixture brought a mixture of benzalmethylamine, O,O-diethylmethylphosphonate and O,O-diethyl-alpha-methyl-alpha-methylaminobenzylphosphonate. Boiling of the title compound with sodium hydride in absolute tetrahydrofuran brought complete conversion into the carbanion, with a complex mixture of products, of which the authors identified only O,O-diethyl-alpha-methylamino-alpha-[(ethylthio)-thiocarbonyl]benzylphosphonate (or its analog), benzaldehyde and O-ethyl-alkyl-xanthogenates. Infrared,  $^{31}\text{P}$ ,  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectroscopy confirmed the structures of the latter compounds. Chemical details are given in the experimental section. References 8: 1 Russian, 7 Western.

[222-12131]

## REACTIONS OF ASYMMETRICAL PHOSPHORUS-CONTAINING AMINODI- AND -TRISULFIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 25 May 81) pp 847-849

TOLMACHEVA, N. A. and KHASKIN, B. A., All-Union Scientific Research  
Institute for Chemical Means of Plant Protection

[Abstract] After earlier showing that the direction of symmetrical tri- and tetrasulfides containing phosphorus reacting with nucleophil reagents is dependent on electron-acceptor effects of phosphoryl and thiophosphoryl groupings, the authors here show that dialkoxyphosphoryl- and thiophosphoryl-N-dialkylaminodi- and -trisulfides react with secondary amines in a way analogous to phosphorus-containing polysulfides. The disulfide bond closest to the phosphorus atom is broken and bis(dialkylamino) mono- and disulfides, and corresponding ammonium salts of thio- and dithioacids of phosphorus, are formed. In reaction with derivatives of trivalent phosphorus, products are formed that contain one sulfur atom less than the initial compounds. Their reactions with thio- and dithiophosphoric acids lead to the formation of bis(dialkyloxythiophosphoryl)tetrasulfides, or products of their partial desulfurization. Chemical details are given in the experimental section. References 8: 5 Russian, 3 Western.  
[222-12131]

## REACTION OF PHOSPHORUS PENTACHLORIDE WITH DIVINYLSULFIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 3 Apr 81) pp 850-853

FRIDLAND, S. V., SHKURAY, I. A. and LAPTEVA, L. I., Kazan' Chemical  
and Technological Institute imeni S. M. Kirov

[Abstract] Earlier studies had shown that  $O_2$  complexes have affected reactions of phosphorus pentachloride with divinyl ester. Other studies have disagreed. The authors conducted the title reaction so the substitutes in the alpha-position were prevented from taking part in the reaction, and it was possible to compare the effects of heteratoms. The reaction was conducted at 10-15° C by dripping divinylsulfide into phosphorus pentachloride suspended in benzene. Results showed high reactivity compared to earlier adducts that under analogous conditions stabilized at the donor-acceptor stage. Analysis showed that, along with the  $C_4H_4SP_2Cl_8$  first noted, dichloranhydrides of beta-(vinylthia)vinylphosphonic acid and beta-(alpha-chloroethylthia)vinylphosphonic acid were formed. Treatment with sulfur dioxide of the first compound brought 4-chloro-4-oxo-2,5-diene-1,4-thia-phosphine, and addition of water produced 4-oxy-1-thia-4-phosphahexacyclo-2,5-diene-4-oxide. Figures 4, references 5 (Russian).  
[222-12131]

## REACTION OF S-ETHYLPHENYLTHIOPHOSPHINITE WITH CHLORANYL

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 28 Jul 81) pp 924-925

AL'FONSOV, V. A., DIANOVA, O. M., GOL'DFARB, E. I., BATYYEVA, E. S. and  
PUDOVIK, A. N., Institute of Organic and Physical Chemistry  
imeni A. Ye. Arubzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Reactions of trivalent phosphorus derivatives as a rule lead to bipolar compositions with a 1:1 ratio, with a preliminary stage of single electron transfer from the PIII atom to quinone. The authors studied the title reaction in benzene, and obtained p-ethoxytetrachlorophenyl ester of diphenylthiophosphonic acid. Its composition and structure were studied by NMR of  $^{31}\text{P}$  and  $^1\text{H}$  spectroscopy and element analysis, and proton magnetic resonance. Chemical polarization study indicated the presence of a radical manner of formation. Replacing benzene with more polar solvents led to a halt in the reaction at the stage of bipolar ion formation, indicating stabilization of the quasiphosphonium center by the solvent molecules. Chemical details and spectroscopic findings are given. References 4: 2 Russian, 2 English.  
[222-12131]

UDC 547.241 + 547.73

## SYNTHESIS OF OXIDES OF HEPTYL-2-(5-R-DITHIENYL)PHOSPHINES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 25 May 81) pp 925-926

KRASIL'NIKOVA, Ye. A., RAZUMOV, A. I. and SHARAFIYEVA, E. S., Kazan'  
Chemical and Technological Institute imeni S. M. Kirov

[Abstract] The authors found an expedient method for introducing a phosphoryl group into the thiophene ring enabling them to produce 60-80% oxide yields of heptyldithienylphosphines, including ones with a substitute at the 5-thiophene position. Thiophene and its derivatives reacted with heptyldichlorophosphine oxide in the presence of zinc powder at room temperature with steady mixing for 5 hours. The structure of the compounds was confirmed by infrared, PMR and  $^1\text{H}$  and  $^{31}\text{P}$  NMR.  
[222-12131]

REACTION OF N,N,N'-TRIS(TRIMETHYLSILYL)AMIDE OF IMIDOPHOSPHENIC ACID AND N,N-BIS(TRIMETHYLSILYL)-1,3,2-DIOXAPHOSPHOLANE WITH 1,1,3-TRIHYDROTETRAFLUOROPROPYLCYANATE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 12 Oct 81) pp 926-927

ROMANENKO, V. D., VOLKOV, G. I. and MARKOVSKIY, L. N., Institute of Organic Chemistry, UkSSR Academy of Sciences

[Abstract] Continuing earlier related work, the authors studied a phosphinite reaction that preserved the coordination number of the phosphorus and led to a functionally substituted amide of imidophosphenic acid. The first title compound reacted with 1,1,3-trihydrotetrafluoropropylcyanate, forming an N,N'-bis(trimethylsilyl)-N-(1,1,3-trihydrotetrafluoropropoxy-N''-trimethylsilylcarbonimidoil)amide of imidophosphenic acid. The direction of electrophil attack was structurally indiscernible. The NMR spectra of  $^{31}\text{P}$  corresponded to those of imidophosphates, while infrared spectra showed variations typical for C=N,  $\text{P}=\text{N}$ , and C-O-C bonds. Chemical details are given. References 3: 2 Russian, 1 German.  
[222-12131]

REACTION OF ANHYDRIDES OF PHOSPHORUS ACIDS WITH ACETYL CHLORIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 3 Nov 81) pp 927-928

YELISEYENKOV, V. N. and SHUMILINA, T. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Depending on structure, amidophosphites react with acetyl chloride either at the phosphorus or the nitrogen atom. The authors studied the effect of acetyl chloride on mixed anhydrides of O,O-dialkylthiophosphoric and amidophosphorous acids. Unexpectedly, symmetrical anhydrides containing 3 phosphorus atoms and acetamide were obtained. Control experiments showed that one product of the reaction was actually a dichlorophosphite. Structures of the anhydrides were confirmed by element analysis, PMR and NMR of  $^{31}\text{P}$  spectroscopy. They were unstable compounds that developed disproportions during the experiments. Chemical details are given. References 7: 5 Russian, 2 Western.  
[222-12131]

## REDUCTION OF OXIMINOCARBAMOYLMETHYLPHOSPHONATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 26 Oct 81) p 929

KHOKHLOV, P. S., KASHEMIROV, B. A. and STREPIKHEYEV, Yu. A., Moscow  
Chemical Technology Institute imeni D. I. Mendeleev

[Abstract] Continuing their earlier work, the authors showed that the title phosphonates are selectively reduced by aluminum amalgam forming  $\alpha$ -aminocarbamoylmethylphosphonates. The structure of the compounds obtained was confirmed by element analysis, infrared, PMR and mass spectroscopy. Chemical details for obtaining O,O-diethyl- $\alpha$ -aminocarbamoylmethylphosphonate, O,O-diethyl- $\alpha$ -amino-N-ethylcarbamoylmethylphosphonate and O,O-diethyl- $\alpha$ -amino-N,N-diethylcarbamoylmethylphosphonate are given. Reference 1 (Russian). [222-12131]

## SYNTHESIS OF 1,4-DIAZA-2,5-DIPHOSPHANES BY REACTION OF ALKYLCHLOROPHOSPHITES WITH BENZALANILINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 16 Jul 81) pp 930-931

MAYDANOVICH, N. K., IKSANOVA, S. V. and GOLOLOBOV, Yu. G., Institute of Organic Chemistry, UkSSR Academy of Sciences

[Abstract] The authors found that alkylchlorophosphites react with benzanilines at 130-180° C in 1-3 hours to form 1,4-diaza-2,5-diphosphanes, with 30-35% yield. The easiest reaction was with methylchlorophosphite, at 140° C for 40 minutes; ethyldichlorophosphite (160-170° C for 2 hours) and diethylchlorophosphite (170-180° C for 3 hours) reacted with more difficulty. The composition and structure of the products were confirmed by elemental analysis and molecular mass, and infrared and NMR spectroscopy. They were 2,5-dichloro-1,4-diaza-2,3,4,6-tetraphenyl-2,5-diphosphane, and 2,5-diethoxy-1,4-diaza-2,3,4,6-tetraphenyl-2,5-diphosphane. Reference 1 (Russian). [222-12131]



FORMING GEOMETRIC ISOMERS OF DICHLOROANHYDRIDE OF 1-METHOXY-3-CHLORO-4-METHYL-2,4-PENTADIENE-2-PHOSPHONIC ACID IN ACETYLENE-ALLENE-DIENE ISOMERIZATION

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 6 Oct 81) pp 932-933

BREL', V. K., NOSOV, B. P., IONIN, B. I. and PETROV, A. A., Leningrad Technological Institute imeni Lensovet

[Abstract] To compare mobility of the alkoxy group and halogen in the allene phosphonate molecule and broaden the synthetic possibilities of such a conversion, the authors attempted synthesis of the dichloroanhydride of 1-methoxy-4-methyl-5-chloro-2,3-pentadiene-2-phosphonic acid. Allene-diene isomers formed in the synthesizing process, leading to formation of geometric isomers of the title dichloroanhydride. The structure of the isomers was confirmed by infrared, PMR and NMR spectroscopy, and also by the ASIS effect. The ease of allene-diene isomerization with chlorine shift was apparently related to the presence of a methyl group at position 4, allowing stabilization of the carbocation when the halogen separated.

References 5: 3 Russian, 2 English.

[222-12131]

DIMETHYLADAMANTYLDICHLOROPHOSPHINE, A NEW TRIVALENT PHOSPHORUS CHLOROANHYDRIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 5 Aug 81) pp 933-934

NO, B. I., ZOTOV, Yu. L. and KAREV, V. N., Volgograd Polytechnical Institute

[Abstract] Previously, only one trivalent phosphorus dichloroanhydride had been described, requiring many stages to produce small yields. The authors synthesized the title compound from dimethyladamantane and phosphorus trichloride in the presence of anhydrous aluminum chloride with heating at 80-90° C for 3-5 hours. Excess phosphorus trichloride served as a solvent. Yield was 48%. Reference 1 (German).

[222-12131]

## ALKYLATION CAPABILITY OF ALKYL(PERFLUOROALKYL)PHOSPHINATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 8 Jul 81) pp 935-936

MASLENNIKOV, I. G., PROKOF'YEVA, G. N., LAVRENT'YEV, A. N. and  
SHCHERBAYEVA, M. M., Leningrad Technological Institute imeni Lensovet

[Abstract] Esters of trifluoromethyl-substituted phosphorus acids are known to have alkylating capability. The authors discovered that heating  $\text{CH}_3(\text{CF}_3)\text{P}(\text{O})\text{OCH}_3$  with  $\text{CF}_3\text{P}(\text{OC}_4\text{H}_9)_2$  brought formation of a new phosphinate,  $\text{CH}_3(\text{CF}_3)\text{P}(\text{O})\text{OC}_4\text{H}_9$ . Partial ester interchange additionally brought  $\text{CF}_3\text{P}(\text{OCH}_3)(\text{OC}_4\text{H}_9)$ , which formed only in the presence of the first phosphinate. NMR spectra agreed with those in other studies for analogous compounds. Chemical details are given. References 5: 2 Russian, 3 English.  
[222-12131]

UDC 547.454 + 547.26.118

## ALDEHYDE PENTOSE CONDENSATION WITH PHOSPHORUS ANALOGS OF CARBONYL COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 28 Jul 81) pp 937-938

ZHDANOV, Yu. A., UZLOVA, L. A. and MAKSIMUSHKINA, L. M., Rostov-na-donu  
State University

[Abstract] The reactions of aldehyde sugars with isocyanacetic and nitroacetic esters and other compounds with an active methyl group were used to synthesize functional-substituted monosaccharides. The authors studied the condensation of aldehydo-L-arabinose and -L-xylose with phosphonoacetic ester and cyanophosphonomethane in benzene in the presence of piperidine. The reaction proceeded randomly to form several substances that were hard to isolate when phosphonoacetic acid was used. With cyanophosphonomethane, a more regular reaction produced nitryl-2,3-didesoxy-2-dibutoxyphosphonyl-4,5; 6,7-di-O-isopropylidene-L-arabinoheptenic acid and analogs, with up to 45% yield. Structures were confirmed by infrared spectroscopy. References 7: 3 Russian, 2 English, 2 German.  
[222-12131]

## 1,2-CYCLOPHOSPHITES OF 3,5,6-TRIMETHYLGLUCOFURANOSE AND 3,5-DIMETHYLXYLOFURANOSE

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 52, No 4, Apr 82  
(manuscript received 28 Jul 81) pp 938-939

NIFANT'YEV, E. Ye., RUMYANTSEVA, S. A., KOROTEYEV, M. P., SISNEROS, Ks. and KOCHETKOV, N. K., Moscow State Pedagogical Institute imeni V. I. Lenin

[Abstract] While cyclophosphites and bicyclopophosphites of sugars obtained by phosphorylation of partially protected hydrocarbons are well known, glycosylcyclophosphites have not previously been obtained. Following the example of phosphorylation of 3,5,6-tri-O-methyl- $\alpha$ , $\beta$ -D-glucofuranose and 3,5-di-O-methyl- $\alpha$ , $\beta$ -D-xylofuranose by hexaethyltriamide of phosphorous acid at 100-110° C, the authors obtained glycosylamidocyclophosphites for the first time, and began study of their stereochemistry and chemical properties. Structures were confirmed by NMR of  $^1\text{H}$ ,  $^{13}\text{C}$  and  $^{31}\text{O}$ . Chemical details are given. References 5: 4 Russian, 1 English.  
[222-12131]

UDC: 546.147:547.558.1

## TETRAPHENYLPHOSPHONIUM PERBROMATE

Moscow ZHURNAL NEORGANICHESKOY KHMII in Russian Vol 27, No 4, Apr 82  
(manuscript received 19 Sep 80) pp 1061-1063

BORISOVA, I. V. and LYCHEV, A. A., Radium Institute imeni V. G. Khlopin

[Abstract]  $\text{Ph}_4\text{PBrO}_4$  was produced using a method utilized earlier to produce  $\text{Ph}_4\text{PClO}_4$ . It is shown that when  $\text{BrO}_4^-$  is potentiometrically titrated with  $\text{Ph}_4\text{P}^+$ , a difficulty soluble compound is formed and precipitates. The purity of the product was tested spectrophotometrically and chromatographically. The  $\text{BrO}_3^-$  impurity does not exceed 0.05%. The x-ray phase analysis performed showed that tetraphenylphosphonium perbromate has the same structure as tetraphenylphosphonium perchlorate, but not potassium perbromate. Figure 1; references 9: 1 Russian, 8 Western.  
[204-6508]

STRUCTURE OF ORGANOPHOSPHORUS COMPOUNDS, PART 22: X-RAY STRUCTURAL STUDY OF 2-TRICHLOROPHOSPHAZOPERCHLOROPROPANE  $\text{Cl}_3\text{P}=\text{N}-\text{CCl}(\text{CCl}_3)_2$

Novosibirsk ZHURNAL STRUKTURNY KHIMII in Russian Vol 23, No 2, Mar-Apr 82 (manuscript received 23 Mar 81) pp 72-76

ANTIPIN, M. Yu., STRUCHKOV, Yu. T., YURCHENKO, V. M. and KOZLOV, E. S., Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences; Institute of Organic Chemistry, Ukrainian Academy of Sciences

[Abstract] The purpose of this study was to establish the precise value of angle PNC and the length of the P=N and C-N bonds, and also to determine the variation between these geometric parameters by comparison of data for a number of phosphazo compounds which have been structurally studied. The phosphorus atom is found to have the ordinary distorted tetrahedral configuration, P-Cl bond length 1.982-1.984 Å, close to the bond length in crystalline phosphorus oxychloride. The valent angles at the phosphorus atom range from 102.2 to 119.0°, the mean value for ClPCl angles being significantly less than for ClPN angles (103.6 and 114.8°). The P-N bond is 1.504 Å in length, the N-C bond is 1.387 Å in length, C(1)-C(2) is 1.601 Å, C(1)-C(3) is 1.598 Å. A comparative analysis of the geometric parameters of the P=N-X fragment is performed for this class of compounds as a function of the nature of substituent X. Figure 1; references 26: 8 Russian, 18 Western.  
[231-6508]

UDC: 548.757+615.748+541.69

CRYSTALLINE AND MOLECULAR STRUCTURE OF HIGH-MELTING MODIFICATION OF O-(β-DIMETHYLAMINOETHYL)PHENYL-α-OXYCYCLOHEXYLPHOSPHINATE IODOMETHYLATE  $[\text{C}_6\text{H}_5(\text{CYCLO}-\text{C}_6\text{H}_{10}\text{OH})\text{P}(\text{O})\text{O}(\text{CH}_2)_2\text{N}(\text{CH}_3)_3]^+\text{I}^-$ : CONFORMATIONAL POLYMORPHISM OF CERTAIN α-OXYPHOSPHORYL COMPOUNDS

Novosibirsk ZHURNAL STRUKTURNY KHIMII in Russian Vol 23, No 2, Mar-Apr 82 (manuscript received 23 Mar 81) pp 81-87

KARDANOV, N. A., TKACHEV, V. V., ATOVMYAN, L. O., GODOVIKOV, N. N. and KABACHNIK, M. I., Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences; Department of Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] Continuing their work on methods of synthesis of β-aminoethyl esters of α-oxyphosphinic acids and their derivatives, the authors established that the compound in the title (I) forms two stable polymorphous modifications upon crystallization from nitromethane, with melting points of 175-176 and 192-193°C. Results are presented from an x-ray structural study of the

crystals of the higher melting modification of I. The results indicate that the primary cause of the polymorphism in these compounds is the conformation state of the fragment  $\text{HO-C-P=O}$ . Characteristic group frequencies of valent oscillations and IR spectra of the polymorphous modifications confirm the formation of strong intermolecular H bonds. Figures 3; references 14: 13 Russian, 1 Western.  
[231-6508]

PETROLEUM PROCESSING TECHNOLOGY

UDC 54-386 : 541.128 : 542.978 : 542.943.7 : 547.534.1

INHIBITING PROPERTIES OF HEAVY METAL CHELATES WITH LIGANDS BASED ON AMINOMETHYLENE DERIVATIVES OF FIVE-MEMBERED HETEROCYCLES IN ETHYLBENZENE OXIDATION REACTION

Moscow NEFTEKHIMIYA in Russian Vol 22, No 2, Mar-Apr 82 pp 254-258

MAZALETSKIY, A. B., VINOGRADOVA, V. G., ALAM, L. V. and KVITKO, I. Ya.,  
Institute of Chemical Physics, USSR Academy of Science, and Leningrad  
Technological Institute imeni Lensovet

[Abstract] Sulfur-containing heavy metal chelate compounds with  $M(S,S)_2$  and  $M(N,S)_2$  chelate units inhibit low-temperature hydrocarbon oxidation. The authors studied several inhibitors of ethylbenzene oxidation. The chelate ligands were aminomethylene derivatives of ketones, thiones and selenones of five-membered N-phenyl-pyrazole, furane and thiophene, with  $M(N,O)_2$ ,  $M(N,S)_2$  and  $M(N,SE)_2$  chelates. The effects of chelate unit composition and the nature of the substitute in the ligand's azomethyne group and of the heterocycle in the ligand, on inhibiting activity, were studied. Tests were conducted at 65-80° C at atmospheric pressure with oxygen or air as the oxidizing gas, and nitrobenzene as an inert solvent. Braking of low-temperature initial oxidation pointed to interaction of chelates and free radicals. A correlation was established for  $M(IS)_2$  chelates between the polarographic oxidation potential and inhibiting activity: the more readily oxidizing chelate units had greater inhibiting action. Changing the structure of Cu(II) from planar to tetrahedral while maintaining polarographic oxidation potential brought a sharp increase in antiradical activity of the chelate compounds, as did a switch from sulfur- to selenium-containing zinc compounds and in general, electron-donor substitutes at the nitrogen atom. Figures 2; references 9 (Russian).  
[221-12131]

## SELECTIVITY OF LIQUID PHASE BENZALDEHYDE OXIDATION AT DEEP CONVERSION LEVELS

Moscow NEFTEKHIMIYA in Russian Vol 22, No 2, Mar-Apr 82 pp 259-264

IVANOV, A. M. and CHERVINSKIY, K. A., Chernovtsy State University

[Abstract] To control oxidation conversions of many alkyl-aromatic compounds, knowledge of the direction of deep oxidation of benzaldehyde is essential, and the selectivity of such simpler oxidation processes must be controlled. The authors present a diagram of the chain and heterolytic consumption of benzaldehyde, taking into account that one of the reagents is a per-acid, the product of the chain oxidation. A unique combination of consecutive and parallel reactions occurs, with maximum per-acid yield at the point of practically 100% aldehyde conversion. The rate of heterolytic aldehyde oxidation could not be slowed for want of a negative catalyst. The chain oxidation required constant  $O_2$  in a liquid phase, which limited the conversion rate. The best catalysts in selective conversion of benzaldehyde and benzoyl-phenyloxymethylperoxide were acetate and cobalt benzoate; they were transitional in aldehyde conversion degree and did not speed the breakdown of oxyperoxide. In deep-liquid-phase benzaldehyde oxidation, cobalt salts and monobasic acids were simultaneously catalysts for homolytic and heterolytic stages of the oxidation process. Figures 5; references 10: 9 Russian, 1 English.

[221-12131]

## SELECTIVE ACTION OF ANTIOXIDANTS IN OXIDATION OF ORGANIC COMPOUNDS

Moscow NEFTEKHIMIYA in Russian Vol 22, No 2, Mar-Apr 82 pp 278-283

NEKIPELOVA, T. D. and GAGARINA, A. B., Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] Selective antioxidant braking is often a feature of hydrocarbon oxidation processes. The authors studied such action and sought their causes for phenols, hydrated quinolines and stable nitroxyl radicals in alkyl-aromatic saturated and unsaturated hydrocarbons, ethylbenzene, styrene and phenylacetylene at 120 and 110° C, controlling the process by monitoring accumulations of ethylbenzene hydroperoxides and consumption of styrene and phenylacetylene. Essential differences in chemical mechanisms and kinetic principles were noted at high temperatures that were related to the nature of reaction center molecules, free radicals and the products formed. A noticeable braking effect was observed with a  $\sim 10^{-4}$  mol/l concentration of ethylbenzene ( $\sim 10^{-2}$  for ethoxyquine), and  $\sim 10^{-2}$  in styrene and phenylacetylene. The most effective retardant in styrene was the nitroxyl radical, with ethoxyquine more effective in phenylacetylene and ionol in ethylbenzene.

Temperatures above 100° C brought much greater consumption of antioxidants. Quinoline braking of phenylacetylene oxidation is attributed to the long life of R radicals and to their chemical structure. The effectiveness of ethoxyquine in ethylbenzene is determined by the direct reaction of the inhibitor with hydroperoxides. Figures 3; references 12: 11 Russian, 1 English.  
[221-12131]

UDC 661.183.123

THERMAL PROPERTIES OF STABILIZED COPOLYMERS OF VINYL BENZYLCHLORIDE WITH DIVINYLBENZENE

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 82  
(manuscript received 3 Jul 81) pp 48-49

KHASHIMOVA, S. M., DZHALILOV, A. T. and ASKAROV, M. A., Tashkent  
Order of Friendship of Nations Polytechnic Institute imeni Abu Raykhan Beruni

[Abstract] To improve thermal properties of polymers, the authors synthesized copolymers containing stabilizing links in the basic chain of macromolecules. The title compounds were combined by a suspension procedure; after swelling them in dimethylformamide, they were treated with a sodium salt solution of 2-mercaptobenzothiazole in dimethylformamide for 7 hours at 40° C. Their thermal properties were determined by dynamic thermogravimetric analysis, which showed that a slight amount of the sodium salt increased thermal stability and hastened emission of volatile products. 2% Antioxidant provided the best effects; higher quantities weakened the stabilizing effect, apparently because of thermal decomposition of the stabilizer. Figure 1; references 6: 4 Russian, 2 English.  
[208-12131]



## POLYMERS AND POLYMERIZATION

UDC 541.6

### DEVELOPMENT OF RESEARCH IN HIGH-DURABILITY AND THERMAL RESISTANT POLYMERS FOR USE IN THE NATIONAL ECONOMY

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 1, Jan 82 pp 3-10

KOTON, M. M., director, Institute of High-Molecular Compounds, USSR Academy of Sciences

[Abstract] This article reviews Institute research in the areas of developing high-durability and thermal resistant polymers and finding practical uses for them, particularly in biology and medicine. Institute advances have included polymers that will retain their durability in a temperature range of -200 to 350° C. Flexible chain polymers were given added durability by new packing procedures that created crossed or parallel configurations of polyethylene and polypropylene with an essential 15-25% macromolecules for strength. Practical applications have been developed in collaboration with the "Plastpolimer" Scientific Production Association. Liquid crystal states have been utilized for durable films and fibers, with special success in synthesizing complex aromatic polyesters. Polyimides based on polypyromellitimides have been developed for many applications where heat resistance is essential. The Institute has also developed fusible polyarimides for producing coiled double-layered ductwork in a more economical way. Fabrics from polyimide fibers developed at the Institute are used for fireproof aircraft, ship and public building decor. In a discussion following Academician Koton's review of the Institute's work, other scholars stressed the combination of pure research and practical application that characterize its work.

[206-12131]

SYNTHESIS AND PROPERTIES OF POLYURETHANE UREAS BASED ON OLIGOMERS WITH AMINO END GROUPS

Moscow KAUCHUK I REZINA in Russian No 4, Apr 82 (manuscript received 29 Oct 81) pp 7-10

MOROZOV, Yu, L., AL'TER, Yu. M. and PRIBYLOVA, L. M., Scientific Research Institute for Resins

[Abstract] Isocyanate oligomer forepolymers have been used as hardeners for durable polyurethane-urea products; the authors conducted detailed studies of the synthesis, structures and properties of these compounds with oligobutylene glyco-urethane diisocyanate, oligopropylene glycol-urethane diisocyanate, and oligobutadiene-urethane diisocyanate. Macrodiisocyanates were obtained by the reaction of oligoester diendoles with toluylene-2,4-diisocyanate. Results showed that properties of the polyurethane ureas depended on the molecular ratio of oligodiisocyanates and oligodiamines in any given test. The oligourethane diamines had commensurate flexible central and rigid-end polar blocks, in proportion to increases in oligodiisocyanate content. Further tests involved adding side methyl groups to polyester-urethane urea and polydiene-urethane urea at the flexible block, which reduced the polymers' durability. Temperatures above 50° C weakened bonds in the polymers, reducing durability again. Thus, the authors concluded that use of specific oligodiamines and oligodiisocyanates could result in obtaining polymers with desired physicomechanical properties. Figures 4; references 13: 11 Russian, (3 trans. from English), 2 English. [217-12131]

UDC 678.067: 677.529

PROSPECTS FOR APPLYING CONSTRUCTION CARBON PLASTICS IN NATIONAL ECONOMY

Moscow KHIMICHESKIYE VOLOKNA in Russian No 2, Mar-Apr 82 (manuscript received 6 May 81) pp 5-8

BUDNITSKIY, G. A., ZAKHAROV, A. V., SMIRNOV, V. S., MOLCHANOV, B. I. and CHUKALOVSKIY, P. A.

[Abstract] The authors reviewed developments in filling plastics with inorganic powder and fiber materials of various types to improve mechanical properties and durability, for use as construction materials. Hydrocarbons for this purpose provide high density and rigidity, low coefficients of linear thermal expansion and friction, durability, resistance to aggressive environments, and thermal and radiation factors, increased heat conductivity, and a range of electrophysical properties. These factors are compared to those of expensive steels and alloys, graphite and other metals, with the

conclusion that hydrocarbon plastics are feasible for use in aviation, defense and cosmic technology, automobiles and agricultural equipment. While the United States is the leader in such applications, in the Soviet Union advances are also being made to replace corrosion-resistant steels and non-ferrous metals with epoxy-hydrocarbon plastics and similar materials. Comparative advantages over metals and current applications of these plastics are listed. References 15: 5 Russian, 10 Western.  
[209-12131]

UDC 677.494 : 677.862

#### PHYSICOCHEMICAL METHODS OF MODIFYING REINFORCING FIBER SURFACES

Moscow KHIMICHESKIYE VOLOKNA in Russian No 2, Mar-Apr 82  
(manuscript received 19 Nov 80) pp 16-18

GAVRILYUK, N. N. and NOVIKOVA, O. A.

[Abstract] Since large use of polymer filaments to reinforce plastics is hampered by their low elasticity and heat resistance and insufficient adhesion, the authors studied polypropylene and polyformaldehyde threads with surfaces modified by a corona charge at 250V and 13.56 megahertz. The fibers were grafted to a methylmethacrylate monomer. Poor adhesion was attributed to low content of reactive centers on the surface and low surface energy. Graft polymerization of methylmethacrylate using post-polymerization was found to be less effective than direct radiation in methylmethacrylate vapor. Infra-red spectroscopy and weight methods determined that the best grafting came with beta-chloranthraquinone from benzene. Processing the polymers in an electrode-free charge eliminated a low-molecular surface layer which improved adhesion properties without changing the polymer's basic properties. Radiation improved surface properties of the polyformaldehyde thread. The corona charge, with 35 KV and thread motion of 10 meter/min, increased all physicomechanical and electrical properties of the organoplastic end product of the experiment. The modified threads were regarded to be promising reinforcing products. Figures 3; references 6: 4 Russian, 2 English.  
[209-12131]

UDC 677.494.743.21-96

#### FIBER FROM FLUOROPLAST-40 (POLYFLUOROETHYLENE RESIN)

Moscow KHIMICHESKIYE VOLOKNA in Russian No 2, Mar-Apr 82  
(manuscript received 3 Apr 81) pp 23-24

KRONFEL'D, A. M., PODLESSKAYA, N. K., KROLIKOVA, Ye. N., TARAKANOV, B. M., BEZPROZVANNYKH, A. V. and VOL'F, L. A.

[Abstract] Fluoroplast-40, with good dielectric properties, chemical resistance and radiation resistance, was extruded and the fibers and threads

produced evaluated in terms of flow, dye and orientational extraction characteristics. Several brands of the title compound were tested. A modifier was added consisting of 1-6% (mol) vinyl monomer containing fluoride, which increased thermal stability and stabilized the molten compound during formation. This allowed production of very fine threads. Optimal extraction temperature was 125-130°C. The fibers produced by thermal extraction showed significant changes in supermolecular structure, increased orientation and crystalline levels, and consequently, greater mechanical durability. The fluoroplast-40 fibers are recommended for filtering materials, anti-friction cables, reinforced plastics, medical sutures and other uses. Figures 2; references 4: 3 Russian, 1 French. [209-12131]

UDC [677.494.675 : 536.495].017.2/7

#### STABILITY AND THERMAL PROPERTIES OF UNTWISTED 'VNIIVLON' FIBER

Moscow KHIMICHESKIYE VOLOKNA in Russian No 2, Mar-Apr 82  
(manuscript received 14 May 81) p 38

KHUDOSHEV, I. F., TSUMAN, E. P., LEVITES, L. M., KRASNYKH, L. F. and TOKAREV, A. V.

[Abstract] The chemical composition of "vniivlon" fiber is not given. The authors tested a 10 mm fiber which was being stretched at 10 mm/min, then heated it for 5 minutes at 250-450° C and stretched the heated fiber. Comparison of values at 50° intervals for 3 variations of the fiber indicate that all but one, rated 14.3 "tex", retained considerable stability up to 400° C. The 14.3 tex fiber was determined to have a defective initial structure. Above 400° C the fibers quickly lost stability. A test of pyrolytic stability showed the "vniivlon" fiber emits CO<sub>2</sub> at 200° and CO only at 350° C, both in insignificant amounts. Reference 1 (Russian). [209-12131]

UDC 541.64 : 547.538.141

#### KINETICS OF STYRENE COPOLYMERIZATION WITH METHYLMETHACRYLATE AT DEEP CONVERSION LEVELS

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 2, Feb 82  
(manuscript received 19 Oct 81) pp 34-37

BELAYEVA, L. S., ZAYTSEVA, V. V., ZAYTSEV, Yu. S. and KUCHER, R. V., academician, UkSSR Academy of Sciences, Institute of Physico-Organic Chemistry and Coal Chemistry, UkSSR Academy of Sciences; L'vov Polytechnical Institute

[Abstract] Previously (this journal, No 12, Dec 78), the authors reported the effects of depth of conversion on the process of radical copolymerization

of styrene with acrylonitrile. In the present study they consider kinetic parameters such as the general rate of the process, initial reaction speed and effectiveness, and constants of initiator decomposition and chain breakdown, relative to various starting monomer mixes of the title compounds. The copolymerization process was monitored by a gravimetric method at 75° C, with the rate of initiation measured by photoinhibition using *n*-butylnitrite. Changes in decomposition constant rates were studied relative to viscosity and polarity of the medium, with the result that such changes were attributed to trigger effectiveness. Increasing styrene content in the starting mix brought sharp changes in triggering rates. Changes in relative values for the initiation rate and the chain breakdown rate led to a practically uniform rate of copolymerization up to 30% conversion, while at 50% and above increased rates were dependent on chain growth reactions. Figures 3; references 10: 8 Russian, 2 English.  
[215-12131]

UDC: 678.686.028:621.039.83

#### BINDER FOR RADIATION CURING OF REINFORCED PLASTICS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 82 pp 18-19

OMEL'CHENKO, S. I., SHLAPATSKAYA, V. V., VIDENINA, N. G., BOKALO, G. A. and BRATSLAVSKAYA, S. A.

[Abstract] A study is made of the results of radiation curing of new epoxy and phenol-formaldehyde binders, as well as acrylic epoxy binders distinguished by high radiation activity and reduced sensitivity to the inhibiting influence of oxygen. Studies were performed on epoxy oligomers with acid number 2-6 mg KOH/g obtained by partial or total esterification of aliphatic and aromatic epoxy oligomers with methacrylic acid in the presence of amine catalysts. IR spectroscopy and differential-thermal analysis were used to establish that acrylated aliphatic diepoxide type ADEG was most active in the process of thermal and radiation polymerization. A strengthening of the adhesion bonding between the filler and binder upon radiation curing was detected, indicating the advantages of this method of producing structural polymer materials. The method is considered both universal and promising. Figures 2.  
[233-6508]

CURING OF EPOXY-NOVOLAC BLOCK COPOLYMERS IN PRESENCE OF COORDINATION COMPLEXES OF ACETYL ACETONATES OF CERTAIN METALS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 82  
(manuscript received 7 Jul 80) pp 20-21

SHUKLA, A. K., KARKOZOV, V. G., NIKOLAYEV, A. F. and VINOGRADOV, M. V.

[Abstract] Epoxy-novolac [soluble phenol-formaldehyde] block copolymers type 16E18N60-0.5 containing 40% ED-16 epoxy resin, 60% SF-010 novolac resin were studied. Nickel, cobalt and zinc diacetyl acetonates with pyridine, 2-methylpyridine and 4-methylpyridine were added, reducing the curing time by a factor of up to 15 or allowing it to be performed in 2 to 4 hours at 125 to 150°C. The reduction in curing time resulted from the joint influence of the metal acetyl acetonate and tertiary amine formed upon heating of the coordination complexes. References 5: 4 Russian, 1 Western.  
[233-6508]

THERMOSTABLE FILM AROMATIC POLYESTER AND POLYAMIDE MATERIALS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 82 pp 21-25

LOGUNOVA, V. I., BELYAYEV, I. S., NAUMOV, V. S., AKSENOVA, A. R., SOKOLOV, L. B., YAKUSEVA, N. N., DOMKIN, V. S., GERASIMOV, V. D. and MIKHAYLINA, V. M.

[Abstract] This review of the literature, including US and Japanese patents, describes some of the specifics of production methods and resulting properties of aromatic polyamide and polyarylate films which are of the greatest practical significance in manufacturing technology. The data are presented which would be needed to determine the areas of their application, which have not been adequately discussed in the literature. The films discussed are thermally stable, some up to 350-420°C, and have excellent insulating properties. They can be used for the manufacture of miniature capacitors and cable insulation. The films can be welded and glued to produce multilayer products. Machine insulation is an important area of application. Figures 5; references 15: 12 Russian, 1 Eastern European, 2 Western.  
[233-6508]

# THERMAL STABILITY OF HPPE-BASED FLAME-RESISTANT COMPOSITES

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 82 pp 32-33

NESMERCHUK, N. S., GILIM'YANOVA, D. S., SHED'KO, L. V., FEDEYEV, S. S.,  
BALBATUNOVA, T. N., VAYNSHTEYN, A. B., ZARINYA, L. V. and KOROTKEVICH, S. Kh.

[Abstract] A study is made of the influence of various stabilizers and chloroparaffin quality on the thermal stability of composites made of high pressure polyethylene containing chloroparaffin and antimony trioxide as antipyrenes. Composites made with type 10703-020 HPPE with  $Sb_2O_3$  and three specimens of chloroparaffin containing 70% chlorine were studied. The induction period of thermal destruction was determined at 160°C and 101324.7 Pa. Thermogravimetric analysis was performed on a derivatograph with a heating rate of 0.1°C/sec in air. Simultaneous use of a hydrogen chloride acceptor and an antioxidant was found to produce composites with good mechanical properties and long term resistance to thermal oxidative aging.

[233-6508]

# THERMALLY STABLE POLYMER FILM PRODUCTION

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 82 pp 39-41

AKSENOVA, A. R., ALEKSANDROVA, Yu. V. and VASIL'YEV, V. A.

[Abstract] Results are presented from a study of the literature, primarily patents, in the area of thermally stable film production technology for films made of aromatic polyamides, polyimides, polyamidoimides, polyamidoesters, polyarylates, polysulfones and polyhydantoins for use as electric insulating materials outside the USSR. Materials studied consists primarily of US, English and West German patents. The analysis showed that patents in the area of technologies for producing films of aromatic polyamides were granted exclusively to Japanese firms. US patents concern primarily the synthesis of polymers for thermally stable films, with less emphasis on production concern methods of synthesis of the polyamidoimides from various raw materials. All patents on polyarylate films describe simultaneous synthesis of the polymers and forming technologies. Thermally stable films based on aromatic polyamides and polyarylates as well as multilayer film products of these materials have been developed in the USSR. References 46:  
6 Russian, 40 Western.

[233-6508]

RUBBER AND ELASTOMERS

UDC (678.743.41-678.742.2-139)541.15

EFFECT OF 'SKEPT-50' ON PROPERTIES OF RADIATION RESINS BASED ON 'SKF-26' FLUOROLATEX

Moscow KAUCHUK I REZINA in Russian No 4, Apr 82  
(manuscript received 12 Jan 81) pp 15-17

SAMOYLENKO, T. G., "ZF NIIRP" [expansion unknown; perhaps "Trans-Caucasus Branch, Scientific Research Institute for Rubber Production?"]

[Abstract] Radiation resins based on SKF-26 brand fluorolater have high heat and corrosion resistance but poor low-temperature durability. Since high viscosity makes these resins hard to modify, the author mixed the title rubbers at temperatures below 50° C using rollers and adding 20 parts by weight of technical carbon and 5 parts of a sensitizer to reduce the optimum radiation dosage. The level of bonding was determined by the amount of swelling in acetone and carbon tetrachloride. The addition of SKEPT-50 reduced the mixture's viscosity and temperature brittle mess. Maximum swelling came with addition of 90 parts SKEPT-50. Improved low-temperature reduction of SKEPT-50 + SKF resins came only with unincubated variants. The author concludes that reducing the brittle temperature and viscosity of the resins studied is related to plastification. Improved durability of the mixtures is related to structural transformations during incubation, and cross-linking is tied to the globular structure of SKF-26. Figures 5; references 9 (Russian).  
[217-12131]



# ESTERS OF 2-DIHYDRODICYCLOPENTADIENYL-2-ALKYLACETIC ACIDS AS EFFECTIVE NEW PLASTIFIERS FOR RESIN MIXTURES

Moscow KAUCHUK I REZINA in Russian No 4, Apr 82  
(manuscript received 21 Jan 81) pp 25-26

ZEYNALOV, B. K., ABASOVA, R. L., SHAGIDANOV, E. N. and ISKENDEROVA, S. A.,  
Institute of Petrochemical Processes, AzSSR Academy of Sciences

[Abstract] In seeking plastifiers for butadiene-nitrile rubbers that would produce high durability, deformation and plastic properties, the authors tested complex esters of the title acids, which are of low cost and readily available and which allow use of a simple process. They found that the plasticity of resin mixtures containing dicyclopentadiene esters was 2-3 times higher than those made with dibutylphthalate. A similar result was found for durability, and in both cases added amounts of the esters further increased the values. The test resins were more elastic and less subject to aging and swelling in organic solvents. References 5 (Russian-1 trans. from English).  
[217-12131]

UDC 678.063.3 : 678

# EFFECTS OF FILLER AND CHEMICAL MODIFIER TYPES ON ELASTIC VISCOSITY PROPERTIES OF RESIN MIXTURES

Moscow KAUCHUK I REZINA in Russian No 4, Apr 82  
(manuscript received 2 Apr 81) pp 28-30

KOKOREVA, O. A., SHVARTS, A. G. and YEVSTRATOV, V. F., Moscow Institute of Precision Chemical Technology imeni M. V. Lomonosov; Scientific Research Institute of the Tire Industry

[Abstract] Chemical modification during mixing can control properties of synthetic rubbers, partially by the reactions between elastomers and between elastomer and filler. The dependence of viscosity on filler quantities, expressed in formulas by Guth and Einstein (separately), was tested. The formulas were shown to be applicable where inactive fillers such as chalk were used, but with chemically-active fillers both the quantity of filler and the nature of their reactions had to be considered: the more active the filler, the larger the amount of initial elastomer entering a rigid phase. Use of "RU-1" and hexachloroparaxylene as modifying agents brought a divergence from theoretical values for the dependence of viscosity on filler quantity, with higher viscosity increases when more than 15 parts by weight of technical carbon were added. This increase is explained by the prevalence of the rubber structuring effect. Figures 3; references 9: 5 Russian, 4 English.  
[217-12131]

HIGH MOLECULAR ANTIOXIDANT PRODUCED BY MODIFYING PREPOLYMER CONTAINING  
TERMINAL ISOCYANATE GROUPS WITH  $\beta$ -(4-OXY-3,5-DITERT-BUTYLPHENYL)-  
PROPIONIC ACID

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 55, No 4, Apr 82  
(manuscript received 19 Nov 80) pp 884-889

DOMNINA, N. S., GOROKHOVA, L. S. and SHAGOV, V. S., Leningrad State  
University imeni A. A. Zhdanov

[Abstract] A study is made of the possibility of synthesizing high molecular antioxidants by modifying a prepolymer with terminal isocyanate groups with  $\beta$ -(4-oxy-3,5-ditert-butylphenyl)-propionic acid. Commercial FP-65, a copolymer of butadiene (80%) and isoprene (20%) with terminal isocyanate groups was subjected to chemical modification. The reaction was conducted in xylene in an atmosphere of argon at 130°C for 12 hours. After 7 hours the reaction system contained no more isocyanate groups. The modified prepolymer was tested as an antioxidant for stabilization of SKD raw rubber. The tests showed that its effectiveness had been doubled. The yield of the attached product in the reaction can be increased to 75% by heating the reaction mixture to 130°C for 5 hours after consumption of the isocyanate and carboxyl groups is complete. The end product is equal to or superior to the commercial low-molecular-weight antioxidant ionol. The new product, called VAO-KF, can provide effective protection from oxidation for rubber to be used under severe conditions. Figures 5; references 8: 6 Russian, 2 Western.  
[232-6508]

## WATER TREATMENT

UDC: 628.35:630\*863.5

### BIOCHEMICAL WASTE WATER PURIFICATION AT THE NIKOLAYEVO HYDROLYSIS AND FERMENTATION PLANT

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian  
No 3, 1982 (signed to press 9 Apr 82) pp 25-26

NAZAROVA, N. S., GOLOVKO, G. P., ZATULA, V. V., ZINCHENKO, I. V.,  
Khar'kov Department, All-Union Scientific Research Institute of Water  
Supply, Sewer Systems, Hydraulic Engineering Structures and Engineering  
Hydrogeology, Khar'kov Division; SHINOV, Yu. I., FORSOV, V. I., KHOMIK, A. I.  
and CHIKISHEVA, L. I., Nikolayevo Hydrolysis-Yeast Plant

[Abstract] The Khar'kov Division has developed a method of biochemical purification of waste water to remove organic compounds by treatment with azotobacter chroococcum, a nitrogen-fixing microorganism, and bacillus megaterium var. phosphaticum, which decomposes organophosphates. The process is performed with or without activated silt, and allows purification of waste waters from acetone and hydrolysis plants. The method has been introduced at the Nikolayevo Plant, achieving a savings of over 68,000 rubles per year. References 4: 3 Russian, 1 Western.  
[234-6508]

UDC 628.165:532.711

### FORMATION OF DYNAMIC IRON HYDROXIDE MEMBRANE AND ITS DEMINERALIZING CAPACITY

Kiev KHIMIYA I TEKHNLOGIYA VODY in Russian Vol 3, No 5, Sep-Oct 81  
(manuscript received 5 Dec 80) pp 402-405

BADEKHA, V. P., TSAPYUK, Ye. A. and KUCHERUK, D. D., Institute of  
Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, UkSSR Academy  
of Sciences, Kiev

[Abstract] The effect of physical chemical properties on the formation of a dynamic iron (Fe III) hydroxide membrane was studied in a reverse osmosis

flow type cell, using 48 nm pore size YAM-500 ultrafilters. Measurement of membrane formation kinetics indicated that after initial filtration, with pore occlusion, a transition to filtration with sedimentation occurs, at about 0.015 kg additive per m<sup>2</sup> of filter support. The process of membrane formation follows the equations of the theory of convective filtration. Microscopy was used to establish that the minimum membrane thickness for sodium retention was 0.1 mm. Particle coagulation above pH 5.6 and dissolution below pH 2 were demonstrated electrophoretically. With increasing pressure ion retention of the membrane decreased, as expected for incompressible particles. The low selectivity of the membrane is connected with high concentration polarization. At low pressure maximal salt retention was seen at pH 3.5-4, corresponding to high particle charge. When the pH of the initial solution was less than 3.7 permeability decreased and selectivity increased, suggesting a change in particle structure. Figures 4; references 8: 6 Russian, 2 Western.

[39-12126]

## MISCELLANEOUS

### INFLUENCE OF ATOMIC HYDROGEN IMPURITIES ON SEMICONDUCTOR CHARACTERISTICS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 May 82 p 2

[Article: "Hydrogen and Semiconductors"]

[Text] Soviet scientists have made a scientific discovery in solid state physics and in the physics of semiconductors. Yesterday it was registered with the USSR State Commission for Inventions and Discoveries.

The properties of semiconductor crystals are known to change radically when various impurities are introduced into them. This is precisely the basis of obtaining semiconductors with prescribed parameters.

Within the broad class of impurities, hydrogen remained a question mark for a long period of time. The traditional research methods of solid state physics were found to be unable to explain the role of hydrogen atoms in semiconductors. But this problem, one of importance to science and technology, required solution because hydrogen is broadly employed in different stages of making semiconductor materials. Using the methods of nuclear physics in a fundamental research effort, the authors clarified the physical picture of hydrogen's behavior in semiconductor crystals and established why its atoms could not influence the electric properties of these materials. Their conclusions were confirmed experimentally by other groups of researchers in leading scientific centers of our country, of the USA and Switzerland.

The authors' discovery laid the basis for further development of the theoretical concepts on so-called impurity centers in semiconductors. The significance of the results lies in the fact that the discovered properties of hydrogen will be accounted for in the creation of new processes for growing semiconductor crystals. In the future it may become possible to use atomic hydrogen impurities in semiconductors to develop sensors picking up high energy emissions.

This discovery, which shed light on the form in which hydrogen and other single-electron atoms exist in the crystalline lattice of semiconductors, was made by colleagues of the Institute of Theoretical and Experimental Physics Ye. V. Minaychev, G. G. Myasishcheva, Yu. V. Obukhov and G. I. Savel'yev, Doctor of Chemical Sciences V. G. Firsov, by colleagues of the State Scientific Research and Planning Institute of Rare Metals Industry ("Giredmet") Candidate of Physicomathematical Sciences D. G. Andrianov and Doctor of Physical Mathematical Sciences V. I. Fistul, and by V. S. Roganov of the Combined Institute of Nuclear Research (Dubna).

11004

CSO: 1841/239

UDC 621.378.33

CHEMICAL LASER BASED ON PHOTOCHEMICAL REACTION OF FORMALDEHYDE WITH CHLORINE

Moscow KINETIKA I KATALIZ in Russian Vol 23, No 2, Mar-Apr 82  
(manuscript received 22 Oct 80) pp 311-314

BOKUN, V. Ch. and SOTNICHENKO, S. A., Chernogolovka Department,  
Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] The authors sought to improve the efficiency of chemical lasers, which suffer from a slow endothermal chain reaction, by using formaldehyde with halogens or halogen-containing compounds. After determining that the mixture of  $H_2CO + Cl_2$  was chemically feasible, the authors used standard chemical laser equipment with photo-initiated reaction of a  $H_2CO : Cl_2 = 1 : 10$  mixture at 10 mm mercury pressure. Photodissociation was found to play no important role in laser generation. Doubling the critical pressure of  $H_2CO$  broke off the generation when  $CO_2$  was added, apparently due to the lower generation threshold of  $CO_2$  and the slower relaxation rate of  $CO_2$  (00°1) on the laser mixture molecules. A qualitative study of laser generation with other halogens showed that generation would also take place on HCl and HF molecules, with the latter having more energy radiation. Figures 3; references 13: 2 Russian, 11 English.  
[219-12131]

CSO: 1841

- END -